The Analyst,

INCLUDING THE PROCEEDINGS OF

THE "SOCIETY OF PUBLIC ANALYSTS."

A MONTHLY JOURNAL OF ANALYTICAL CHEMISTRY.

Edited by

G. W. WIGNER, F.C.S.,

one of the

Hon. Secretaries of the Society of Public Analysts.

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THE ANALYST.

THE ANALYST appears, primarily, as the organ of the "Society of Public Analysts," and, secondly, as the representative of Analytical Chemists in general.

The Society of Public Analysts is still in its infancy, but at a very early period of its existence it became manifest that a literary organ of some kind was essential to its success.

Under these circumstances, and in the very early days of the existence of Public Analysts as a corporate body, an experiment (purely temporary) was made of utilising the columns of an established Chemical Journal, for the purpose of reporting the proceedings of the Society.

It was found, however, as the Society enlarged its borders, that as Public Analysts unfortunately could not entrench themselves within the quietude which ought to obtain in a Laboratory, but had occasionally to appear in Police Courts, a merely technical journal did not supply a sufficiently expansive vehicle for the communication of matter which, though not scientific, was of vital interest to Public Analysts as such.

Hence the object of THE ANALYST is not only to present to its readers the latest and best authenticated processes of analysis as they are perfected, but to publish all cases of prosecution for adulteration, and such parliamentary and other proceedings as may appear to touch the interests of Analysts in general.

This is, at all events, the task we propose to ourselves, relying upon the loyal co-operation of all Analysts.

SOCIETY OF PUBLIC ANALYSTS.

On the 15th Inst. an Ordinary Meeting of the above Society was held at Cannon Street Hotel.

Mr. Wanklyn, Vice-President, occupied the Chair.

There was a numerous attendance of members, and the interest of the Meeting was enhanced by the presence of an unusally large number of visitors.

After the ordinary routine business had been transacted the following resolution was put from the Chair :—

"That the name of Professor A. G. Anderson be removed from the roll of members "of this Society, and that the Secretaries be directed to inform him of such removal, "and announce the fact in the Society's journal."

A ballot was taken and the Resolution was carried unanimously.

The Scrutineers appointed to examine the voting papers, announced that the following gentlemen had been elected.

Member—Mr. J. W. Thomas.

Associates—Messrs. S. T. Clothier, Francis Heron, L. de Koningh, E. Lapper, H. G. D'Arcy Power.

A Paper on the Determination of Quinine was read by Mr. Allen, and another on the Analysis of Butter was read by Dr. Muter.

Each Paper led to a lengthened discussion, and the Meeting did not terminate till a late hour, three other Papers being held over.

The announcement by Mr. Wigner of the early appearance of the first number of THE ANALYST was received with applause.

NOTE ON THE EXAMINATION OF WHISKY AND OTHER SPIRITS, FOR METHYLATED SPIRIT AND FOUSEL OIL.

By A. Dupré, Ph. D., F.R.S.

Read at an Ordinary Meeting of "The Society of Public Analysts" held on Feb. 16th, 1876.

A.—Examination for Methylated Spirit.

Now and then we hear of a whisky supposed to be adulterated with methylated spirit. I myself have had several such suspected whiskies to examine, but failed to detect such an adulterant. My belief is that such adulteration is extremely rarely if ever practised, and that most, if not all, of the cases reported, are based on an error in analysis.

Under these circumstances, I have thought it might be of interest to other analysts to describe the method I have adopted for some time past, for testing spirits suspected of being adulterated with methylated spirit. Five fluid ounces of the suspected spirit are distilled twice, having been rendered alkaline the first time, and acid the second time, about two-thirds being distilled over each time. The distillate is now shaken up with dry potassium carbonate, and, after standing over night, the upper layer is taken off by a syphon or pipette, and again twice distilled, about half an ounce being driven over this time. This last half-ounce will be found to contain any methylic alcohol present in the original five ounces.

All the distillations should be conducted in an apparatus having the receiver connected air-tight with the condenser, and furnished with a mercury valve, allowing of expansion and contraction of the air, but presenting loss by evaporation during the distillation. About one-third of this distillate is now diluted to a strength of from 10 to 15 per cent. by the addition of distilled water, or 70 fluid grains are made up to about 500. In this diluted spirit the alcohol is now determined. 1st, by specific gravity; 2nd, by means of Geissler's vaporimeter; and 3rd, by oxidation into acetic acid, and volumetric estimation of the latter.

With pure alcohol, all three methods give results which should agree to within at least one-tenth of a per cent. If, however, any appreciable amount of methylated spirit is present, the results will differ more or less widely.

The specific gravity will give the total amount of both alcohols present, the specific gravity of aqueous methylic and ethylic alcohols being almost identical. Geissler's vaporimeter will, however, now give a higher result, the higher the more methylic alcohol is present, this alcohol having a lower boiling point than ethylic alcohol, or, at the same temperature, a higher vapour tension.

On the other hand, the oxidation process will yield a lower result, since the methylic alcohol, when completely oxidised by sulphuric acid and potassium dichromate, yields only water and carbonic anyhydride, which, of course, is not estimated volumetrically. This process will therefore indicate only the ethylic alcohol present in the mixture, and the difference between the strength thus found and that derived from the specific gravity, gives a rough indication of the proportion of methylic alcohol present.

When pure aqueous alcohol is oxidised in this manner in a closed flask, it will be found, on opening the flask after cooling, that, if anything, a slight vacuum has been produced in the flask. If, however, any appreciable amount of methylic alcohol is present, it will be found that, on opening the flask, a slight escape of gas takes place, owing to the carbonic anyhydride produced.

For details of the method of oxidation, I must refer you to the work on wine, by Dr. Thudichum and myself (page 207). Should the presence of methylic alcohol be indicated by this process, the remainder of the half-ounce may be employed for confirmation by other tests, such as production of methyl aniline-violet, or oxalate of methyl. The method, however, will, I think, be found valuable chiefly as yielding very strong negative evidence, and when once one gets accustomed to it, it is very easily worked, much more so than might perhaps appear from my description of it.

In conclusion, I will give two experiments, showing the working of the process.

Firstly. A pure whisky, when treated as above, gave the following results for the diluted final distillate :—

Strength by specific gravity.........	9 83 per cent.
„ „ vaporimeter	9.75 „
„ „ oxidation	9·75 „

A portion of the same whisky was now adulterated with 10 per cent. of ordinary methylated spirit, and again tested. The final diluted distillate now gave :—

Strength by specific gravity.........	10·08 per cent.
„ „ vaporimeter	10 45 „
„ „ oxidation	9·50 „

The differences between the three estimations are, as will be seen, so great, that we are justified in concluding that as small an addition as 2 or 3 per cent. of methylated spirit would be distinctly recognisable, and that, at all events, as much as 5 per cent. could not possibly be overlooked.

B.—Testing for Fousel Oil.

From time to time, a certain amount of commotion is produced in the public mind, by alarming statements regarding the presence of fousel oil in spirits, and it's alleged maddening effect on consumers of such spirits, and, analysts have even been found certifying certain spirits to have been adulterated with fousel oil. Now in the first place I am not aware that any perfectly trustworthy evidence exists of the alleged injurious effects of fousel oil, and secondly I believe it is utterly absurd to suppose that any spirit is ever in any proper sense of the word, adulterated with fousel oil. Nevertheless the subject is an interesting one, and as I have not seen any process described for the detection and approximate estimation of the small quantities of fousel oil, such as are usually found in spirits, I venture to bring the following method, which I have employed for years past for this purpose before this society, without wishing to claim any special novelty for the process.

Fousel oil, as is well known, consists of a mixture of various of the higher homologues of ethylic alcohol, all or most of which, when oxidised by means of sulphuric acid and potassium dichromate, yield their corresponding acids and these latter are much more readily separated than the alcohols.

Upon this fact the method is based. An amount of spirit containing from one to two grammes of alcohol, previously distilled if necessary, is oxidised in a closed flask by means of sulphuric acid and potassium dichromate, care being of course taken to have an excess of this mixture in the flask. I usually digest the mixture in the flask for two hours in a water bath.

When cool the flask is opened, the excess of dichromate present reduced by zinc, and the acids produced are distilled off (see the work previously quoted). The acid distillate is now neutralized with a standard solution of normal soda, the solution is

evaporated to a small bulk and transferred to a retort. An amount of normal sulphuric acid equal to one twentieth of the normal alkali used is now added, and the contents of the retort are distilled to dryness in an oil bath; the temperature being allowed to rise to about 130 deg. C. Water is now added and a further addition of one twentieth proportion of normal acid is made, after which the contents are again distilled to dryness. These two distillates may be collected separately, but I prefer to collect them together. It is advisable to add some water to the dry residue in the retort, and again distil to dryness repeating this addition of water and distillation three times after the second addition of acid. The acid distillate which contains all the acids higher in the series than the acetic acid, together with a proportion of this latter, is now neutralised by means of pure carbonate of barium, the solution is boiled, filtered, evaporated to dryness, the residue dried at 130 deg. C. and weighed.

The amount of barium contained in the salt is now estimated in the usual way by conversion into the sulphate. We now have the necessary data for calculating the amount of fousel oil contained in the spirit under examination, on the assumption that it consists either of amylic alcohol or of any other alcohol that may be supposed to be the chief impurity present. The real amount present cannot of course be obtained without a knowledge of the exact nature of the acids produced, but even this can be accomplished according to Ducloux (compts. rénd. lxxviii. p. 1160), by submitting the mixture of acids to fractional distillation, and estimating the proportion of acid which does over with each fraction.

In conclusion I will give the analyses of a few spirits by the foregoing process.

A sample of Scotch whisky, strength 54·5 per cent. by weight in volume was found to contain 0·108 per cent. amylic alcohol (Ba in $\frac{1}{10}$ acid 53·49 per cent.)

The same spirit submitted to a process of purification gave no trace of fousel oil. (Ba in $\frac{1}{10}$ acid, 53·73 per cent.)

A sample "of cape smoke," strength 35·75 per cent. by weight in volume was found to contain by weight in volume 0·089 per cent. amylic alcohol. (Ba in $\frac{1}{10}$ acid, 33·39 per cent.)

A sample of common "samsho," strength 21·51 per cent. by weight in volume, contained 0·04 per cent. amylic alcohol. (Ba in $\frac{1}{10}$ acid 53·46 per cent.

A sample of fine "samsho," strength 24.49 per cent. by weight in volume, contained 0·038 per cent. amylic alcohol (Ba in $\frac{1}{10}$ acid 53·42 per cent.), calculating in each case the proportion of amylic alcohol to 100 ethylic alcohol we get.

Scotch whisky	for 100 ethylic	0·19	per cent.	amylic alcohol.
Cape smoke	,, ,,	0·24	,,	,,
Common samsho	,,	0·18	,,	,,
Fine ,, ,,	,,	0·13	,,	,,

A brief discussion ensued.

SOCIETY OF PUBLIC ANALYSTS.

DATES of Meetings in the present year:—

May 3rd. June 14th. November 15th.

We have great pleasure in announcing that the above meetings will, by the courtesy "The Chemical Society," be held in the MEETING ROOM of that Society, Burlington e, Piccadilly, W.

ON THE ANALYSIS OF BUTTER.

By Dr. John Muter, F.C.S.

Read at an Ordinary Meeting of the Society of Public Analysts, held March 15th, 1876.

Butter differs from all other fats inasmuch as it contains a notable proportion of fatty acids other than oleic, stearic, palmitic, and their congeners. If we analyse the pure glycerides of these latter acids we obtain, by the taking up of three molecules of water during saponification and subsequent liberation of the acids, amounts which almost exactly approximate themselves to theory. There is no process in the whole range of analytical chemistry more accurate in the hands of those who know the importance of never trusting to the eye to decide whether vessels, &c., are free from fat, but of invariably drying every article used, and extracting it afterwards with ether. If precision is to be attained, the principles of mineral analysis must not be applied. Fat precipitates cannot be treated as if they were barium sulphate, and expense in the shape of such articles as ether and absolute alcohol must not be spared. I am entitled to put this point strongly before public analysts, because of the experience in fats possessed by myself and my assistants owing to our having been specially thrown into this branch of analysis some years ago. Unfortunately, with a laudable desire no doubt to introduce simplified processes, Messrs. Angell & Hehner have touched dangerous ground, and proposed the washing of fatty acids on a filter, with hot water, taking it for granted that because no fat was visibly coming through, they could manipulate thus in safety. I will venture to say, however, that every one of the few chemists who have been called upon to work in fats for commercial or scientific purposes, would agree with me that such a process is in the highest degree dangerous. Not only should fatty acids never be trusted out of the vessel in which they are precipitated until they are finally transferred to the weighing capsule, but also every rod, beaker, and even the filter paper used to pass the washings, should be dried and extracted with a suitable solvent. Mr. Angell, himself, evidently feels the difficulty, because in his book he gives a special instruction that "great care must be observed in the washing." I hold that processes requiring such delicate care are not suitable for use under a penal statute; and, indeed, I go further and say, that with even the highest precaution, a constant loss of at least 5 centigrams to 1 decigram is made in every analysis on this principle, using 5 grams of fat. By accurate methods, such as it will be my aim to point out in this paper, the following pure glycerides can be so nearly analysed to theory as to be made to show :—

Tristearin	95·70
Triolein	95·52
Tripalmatin	95·27

and no process of washing on a filter ever could come within, at the nearest, half a per cent. of these results, except by an accident. A very striking case in point is afforded by Messrs. Angell & Hehner. After giving analyses of tallow, lard, and cocoa butter (the latter two being, by the way, about ·5 per cent. short of the ordinary yield), they introduce an analysis of palm oil, in which they admit a deficiency, but fancy that it is accounted for by colouring matter. Now palm oil is a specialty of ours, one of my staff having for six months done nothing else almost, and I can assure you that there is no palm oil in the market yielding so low an amount of fatty acids by at least 2 per cent. Indeed it is a fact that commercial palm oil always yields over theory owing to free acidity, and the most highly coloured samples give no appreciable loss of weight when

the colour is destroyed by heat. Here, therefore, is the decigram loss in 5 grams plainly manifest.

Besides the glycerides already referred to, butter contains tributyrin in considerable proportion, with small traces of tricaproin and tricaprylin. I have not yet sufficiently separated these traces for estimation, as their fractional liberation from barium is very troublesome; but of this much I am certain, that they are only present to a very small amount. That this is so may be proved by supposing a butter to yield 88 per cent. of insoluble acids (oleic, stearic, and palmitic, the latter two being present in the proportion of the so-called Margaric acid of older writers). This will represent 92·14 per cent. of glycerides, leaving 7·86 for glycerides of the soluble acids. If the latter were all tributyrin it would give a soluble acidity of 6·88, but in practice this does not come out. Taking a butter yielding an amount nearly like 88, we have—

Insoluble acids	87·96	equal to	92·10	glyceride
Soluble acids (as butyric)	6·72	,,	7·69	,,
Total	94·68	,,	99·79	total glyceride

thus showing a deficiency of about ·2 per cent. owing to the traces of higher soluble acids. The difference thus shown may be disregarded, as, although a little variable, it always comes within ·7 per cent. Calculating therefore always as butyric, we come to this fact—that no analysis of butter can be held to be complete unless both the soluble and insoluble acids be estimated, and they come, when added together, within a fair range of 94·8, allowing for possible experimental errors to, say, the extent of ·3 to ·5 per cent. in either direction.

The process I adopt for the full analysis of butter is as follows:—

(1) 1500 grains of the butter are placed in a counterpoised porcelain dish, over a very low gas flame, and stirred with a thermometer at a heat not exceeding 230 deg. F. until all the water is driven off, which is indicated by effervescence entirely ceasing, and the curd and salt settling perfectly down to the bottom of the dish, leaving the absolutely clear melted fat. The whole is then cooled and weighed, and the loss calculated to percentage of *water*. This is the only method of absolutely and rapidly drying a fat, and the large quantity taken ensures a more perfect estimate of the true amount of water in the sample. I have proved by careful experiment that the temperature of 230 deg. has not the slightest influence on butter fat.

(2) The fat is melted at a gentle heat, and poured off as far as possible into a beaker, without disturbing the sediment. The remainder is poured on a weighed filter, placed over a beaker in the drying chamber, and, when all is through, the basin and filter are rinsed with petroleum spirit to remove all the traces of fat, and the filter being dried and weighed gives *curd* plus *ash*.

(3) The filter after being weighed is placed in a weighed platinum crucible, and gently ignited. This gives *ash*, called *salt* in the report.

(4) The fat poured off from (2)—which will generally be about 1200 grains—if absolutely clear, is at once used for physical and chemical examination; but if *not* perfectly free from specks it must be filtered through a Swedish filter kept hot on the water bath. The processes necessary are, the taking of the specific gravity of the fat at 100 deg. F., and if that gives an adverse indication, the estimation of the total fatty acids of the butter fat both soluble and insoluble.

FIRST.—*The "Actual Density" at* 100 *deg. F.*—This process was first publicly described by Mr. Bell, of the Inland Revenue Laboratory, in the Southwark Police Court. As employed by him, however, the results do not appear to be those of actual density, nor do I consider that the precautions to ensure accuracy are quite sufficient, considering the rapid expansibility of melted fats by heat. I will give his process in his own words. "The fat is taken out of the water bath and poured into the bottle until it is filled up to "the neck. One person then takes the bottle and another the residue of the fat, and "both are brought to exactly 100 deg. F., when the bottle is filled from the residue and "stoppered in the usual way." Now I have tried this method but I find that, supposing the fat to be taken from the bath at, say, 200 deg., and each person cools his portion to 100, then the pouring in and stoppering will frequently, by a little want of care, cause the bottle to be closed when a part of its contents has gone below the 100, to the extent of 2 degrees; because when fat is taken at 100 "on the fall," it will lose a degree of heat almost in a few seconds. At all events, the process can never be absolutely certain within one or two grains on the 1000 grain bottle. The results he gave in court embrace a range from 909·00 to 905·00, and these at once show that the actual density is not indicated.

I take the actual density of a fluid to be the weight of any given volume of it, as compared with that of an equal bulk of distilled water *at the same temperature.* These results compare butter at 100 deg. with water at 60 deg. to 62 deg. F., and are not therefore actual densities; and I submit, that to get the true advantage of inequality of expansion, the water and butter must *both* be taken at 100 deg. F. The process I adopt is as follows:—

A 1000 grain bottle is procured with rather a pear-shaped neck, and fitted with a thermometer stopper ranging from 32 deg. to 140 deg. F. The long mercurial bulb comes exactly down the centre of the bottle, and the scale is up above the stopper. The bottle is placed on the balance, and an accurate counterpoise prepared for it. It is then filled with recently boiled distilled water, at 95 deg. F. The stopper is inserted, and the whole at once plunged up to the neck into a 12 oz. squat beaker partially filled with distilled water at 103 deg. F. in which is placed a thermometer. As the temperature rises in the bottle, the water leaks out at the stopper, and in a few minutes (if the quantity of water in the beaker be properly regulated), a time arrives when the temperature of both thermometers equalise themselves at 100 deg. The joint between the stopper and the bottle is instantly wiped with a small piece of filter paper to absorb loose water, and the bottle is lifted out, thoroughly cleansed and weighed. By repeating this three times the actual contents of the bottle at 100 deg. F. is obtained, and the weight taken, before a fall of more than 5 degrees takes place. At first I let the bottle cool to 60 degrees so as to avoid currents; but I found that it was better in practice to weigh at once, and quite as accurate. This weight of water is scratched on the bottle with a diamond, and all is ready for the butter. The pure butter fat, prepared as already described, is taken from the bath and cooled to 95 deg. F., it is then poured into the bottle, and the whole operation repeated *thrice*, exactly as with the water, and the mean of the three weighings thus obtained is divided by that of the water. The contrivance of having a "*rising*" fat heated by a "*falling*" water until the two equalize, is the height of accuracy, and moreover gives an appreciable rest in the variation of the temperature sufficient to enable the excess of fat which has leaked out to be removed exactly at the required temperature.

Mr. Bell stated in court that there was an analogy between the specific gravity and the per centage of insoluble fatty acids, and here he is correct. The following are som of the figures he has given compared with the true results found by full analyses, the worst of which came to within ·5 of the truth on the whole addition:—

Mr. Bell's "Gravity" at 100 deg. compared with water at 60 deg.	Mr. Bell's comparative fatty acids working by the filter process and without the check of a full analysis.
909·00	85·30*
{908·00	86·45
{907·40	86·87
906·52	87·50
906·18	87·85
905·75	88·30
905·32	88·75
905·00	89·15

The "Actual Density" at 100 deg. as compared with water at the same temperature.	The actual insoluble acids found submitted to the check of full analysis.
·91382	87·47
·91346	87·89
·91337	87·98
·91290	88·48
·91286	88·52
·91276	88·62
·91276	88·61
·91258	88·80
·91246	89·00

The whole nine examples by my process are corresponding to butters between 908 and 907 by Mr. Bell's gravity, and the results show a much higher and more regular per centage of fatty acids. The regular loss on the filter process I have already referred to, is strikingly manifested by the following comparison. I happened to have a butter which gave 9 1286 actual density, corresponding exactly to 907·4 of Mr. Bell's gravity, and so we see by the filter washing Mr. Bell makes that show 86·87, while on full analysis by my process it shows 88·52, or as nearly as possible the decigram in five grams difference, as seen in the palm oil experiment.

While therefore we must admit the great correspondence of the density and acids when both are properly taken, it is to be noted that the moment you come to mix butter with other fats the whole thing is upset for quantitative purposes. The fats used for butter mixing are some of them of an "actual density" of ·90659 (dripping) to ·90294 (vegetable "butterine,") and therefore all we can say as regards specific gravity is that if a butter shows anything over ·91100 "actual density," it may safely be passed over without further analysis as being good.

Second.—*The Total Fatty Acids.*—About 10 grams (or 150 grains) of the butter fat at 100 deg. F. are weighed by difference from a suspended tube into a clean dry 15 ounce flask, and 5 grains of Potassium Hydrate, with 2 fluid ounces of rectified spirit are added. The flask is placed in a basin with hot water, and kept boiling for a considerable time, until on adding water not the faintest turbidity occurs. Ten ounces of water are added, and evaporation continued (just short of boiling) until all traces of Alcohol are dissipated. The contents of the flask are then made up to 7 ounces, with nearly boiling water, and a good fitting cork having been introduced, through which just passes a tube 2 feet long and ending in a small funnel, 5 grammes of full strength

* This result is an extraordinary instance of the filter process. No such butter is to be found in nature.

Sulphuric Acid are poured in down the tube followed by some water. The whole is then agitated with a circular motion until the soap, which rises suddenly, is changed into a perfectly clear and transparent stratum of fatty acids. The flask and contents are then cooled down to 40 dg. F., till a perfectly solid cake of fatty acid forms. A few drops of cold water are run in to wash the tube, and the cork having been removed, a small piece of fine cambric is placed over the mouth of the flask, held *in situ* by an ordinary India rubber ring. The fat cake is caused to detach itself from the sides of the flask by a gentle movement, and then the filtrate is decanted, without breaking the cake, into a litre test mixer, with a good stopper. About an ounce of cold water is poured into the flask through the cambric, and the whole cake and flask rinsed out by gently turning round and the washings added to the filtrate. Six ounces of water at 120 deg. are now added through the muslin, which is then quickly detached, and the cork and tube inserted. The whole is again heated, this time to 200 deg., and kept constantly agitated with a circular, but not a jerky motion for five minutes. This agitation so divides the fat, that it almost forms an emulsion with the water, and is the only means of thoroughly and rapidly washing fatty acids without loss. In practice no Butyric Acid comes off at 200 deg., but any trace that might do so, is caught in the long tube. The cooling and filtering are then again proceeded with as above described, (the filtrate being added to the contents of the test mixer,) and the washings are repeated alternately cold with 1 ounce, and hot with 6 ounces of water, until they do not give the slightest change to neutral litmus. After thoroughly draining the residual cake by letting the flasks stand upside down for some time, the cambric is removed and the flask is laid out on its side in the drying oven, with a support under the neck, until the acids are thoroughly fused, when they are poured while hot into a tared platinum capsule, dried and weighed. The film of fatty acid still remaining on the flask is rinsed out with ether, and dried in a small weighed beaker, and the weight added to the whole. If any drops of water be observed under the fatty acids in the capsule after an hour's drying, the addition of a few drops of absolute alcohol will quickly cause them to dry off. If any trace of fat is on the cambric it should be also dried and extracted with ether, but with care not to break the cake at the last pouring off, this does not occur.

The process is absolutely accurate, and the merest tyro cannot make any loss so long as he does not deliberately shake the melted acids against the cork, which he could not do if he practices a circular agitation while washing.

The filtrate in the test mixer is now made to an absolute bulk, and in 200 c.c. the total acidity is taken with a weak solution of sodium hydrate. The solution I generally use represents ·01 of NH_3 in each c.c., as it serves also for nitrogen combustions; but a useful strength would be decinormal soda, containing ·004 Na H O in each c.c. The acidity found is multiplied by five, calculated to H_2SO_4 and noted as "total acidity as H_2SO_4": 100 c.c. are next taken, and precipitated with barium chloride in the presence of a strong acidulation, with hydrochloric acid, well boiled and washed by three decantations, boiling each time; and, lastly, on a filter, till every trace of soluble barium is removed. The precipitate is dried, ignited, and weighed as usual, multiplied by ten, and calculated to H_2SO_4, and noted as "total sulphuric acid." Lastly, 100 c.c. are evaporated to dryness over the water bath in a tared platinum dish holding 120 c.c., and furnished with a cover of platinum foil, also tared. When dry the dish is covered and heated over a bunsen till all fumes cease, and a fragment of pure ammonium carbonate

having been added, the whole is again ignited and weighed. The amount of potassium sulphate found is multiplied by 10 and calculated to H_2SO_4, and noted as "combined sulphuric acid." The rest of the calculation is obvious to any analyst, but I give an example:

Ten grammes taken.

Total acidity as H_2SO_4	....	0·814
Total H_2SO_4	....	4·9
Combined H_2SO_4	....	4·4

$4{\cdot}9 - 4{\cdot}4 = {\cdot}5$ free H_2SO_4

$0{\cdot}814 - {\cdot}5 = {\cdot}314$ acidity due to butter acids stated as H_2SO_4

$$\text{Then } \frac{{\cdot}314 \times 176}{98} = {\cdot}564 \text{ butyric acid in 10 grammes taken which equals } 5{\cdot}64 \text{ per cent.}$$

By this means we get the soluble acids indirectly by processes which are the every day work of nearly all commercial analysts.

I have only to remark that the barium sulphate should always be washed very carefully, and seeing that it regularly weighs a little over a gramme, it is advisable to boil up with dilute hydrochloric acid after ignition and see that clear liquid gives no cloud with sulphuric acid.

The following may be taken as fair specimens selected from a great mass of results by my process, and as a proof of the almost impossibility of error we have the check given by the totals found. I may also state, that another fact which speaks well is, that I have taken the same sample, one to two months apart, without getting one-tenth per cent. variation in the amount of insoluble fatty acids

I.—A rich butter which by theory from the density should yield

Soluble acids	....	7·05
Insoluble acids	....	87·8
		94·85

was analysed twice and in each analysis two determinations of sulphates were made.

		1st Analysis.				2nd Analysis.		
Soluble acids	....	6·92	...	6·89	....	6·85	...	6·93
Insoluble acids	....	87·56	...	87·86	....	87·87	...	87·87
		94·78		94·75		94·72		94·80

II.—A poor butter showing by theory from density 88·8—

		Theory.		Practice.
Soluble acids	....	6·10	....	5·77
Insoluble acids	....	88·8	....	88·95
		94·90		94·72

III.—A butter showing from density 89—

		Theory.		Practice.
Soluble acids	....	5·94	....	5·76
Insoluble acids	....	89·	....	89·10
		94·94		94·86

IV.—A sample of butter purchased at the same shop and same price as the Southwark disputed butter, and showing a similar amount of insoluble acid—

		Theory.		Practice.
Soluble acids	....	2·09	....	1·98
Insoluble acids	....	93·30	....	93·30
		95·39		95·28

V.—A sample of Belgian "Butterine," from vegetable fat—

		Theory.		Practice.
Soluble acids	....	0·0	....	0·23
Insoluble acids	....	95·6	....	95·50
		95·6		95·73

These are only a few of the mass of results I have, which I have selected to show my views of the composition of butter. They are each examples of a special class. No. I. being a first-class Aylesbury butter. No II. an old low-class Dutch butter, kept six months, until quite unfit for food. No. III. a butter which had lost all character, and was not distinguishable from a piece of tallow, although genuine Friesland eight months ago. No. IV. was evidently two-thirds foreign fat; and No. V. was all vegetable fat, and the two-tenths per cent. of soluble acids are an experimental error.

I intend, if able to spare the time, to return to the subject at our next meeting, and answer the questions (1) What is the average composition of natural butter? and (2) How far may the butter be affected by time? as it would take me too long now to quote the many results I have. In the meantime, I may say that I have every reason, from my experiments, to take 88 as a *fair standard of butter calculation*, if associated with at least 6·3 of soluble acids. But I would not apply any charge of admixture to a butter which showed less than 89·5 insoluble with 5 soluble. You will notice that I give the standard of calculation an condemnation differently, and I think this is the proper way, because if a butter really more than passes the utmost possible limit of the article, even when rendered quite unsaleable by decomposition, the admixture being then definitely proved, should be calculated on the fair ordinary standard. This is a point which has been rather lost sight of in milk, and I think we should consider it in fixing any fresh standards. As to any great change in butter by time, calculated to invalidate results of the standards I have given, I believe that when the supporters of that theory get rid of the filter-washing of fats, they will find that apparently enormous changes were due to the fact that now and then by chance they fully estimated their acids. They will also, I think, find, except in the very height of summer, a butter with less than 87 a natural curiosity. It is worthy of note that as soon as admixture steps in, the total acids rise above 95 per cent. I have to thank my chief assistant Mr. De Koningh, an associate of this society, for his accurate work in the practical portion of my researches.

Mr. Otto Hehner said that it was evident that the results obtained by Mr. Angell and himself prior to the publication of their book, were too low in the percentages of fatty acids. Their experience, at that time, led them to assume a standard of 85·85, but they found since that 87 per cent. was the correct proportion. He considered that Dr. Muter's method of obtaining and estimating the volatile acids was a complete confirmation of the process which they had introduced, while, at the same time, he admitted the superior accuracy of Dr. Muter's method of manipulation.

Dr. Dupré took exception to several statements in the paper, and urged the following points:—

First.—That the specific gravity of the melted fat should be compared with water at 60 deg. F, or 62 deg. F, or at 4 deg. C.

Second.—That the method of heating the fat to the required temperature was not, in his opinion, sufficiently refined. He considered it necessary to keep it at the temperature in a water bath for at least ten minutes before weighing, in order to ensure accurate results.

Third.—The thermometer, he considered, should have an elongated bulb, reaching through nearly the entire length of the specific gravity bottle.

Fourth.—That the loss on the basin and beaker used in the experiments which he had made on Hehner and Angell's process, was less than that found by Dr. Muter.

Fifth.—That the mode of estimating the volatile acids was difficult, and three different estimations entering into the calculation, was more liable to error.

Sixth.—That the plan described by himself (Dr. Dupré), at the previous meeting, namely heating the butter fat with water in a closed tub to 500 deg. F, at which temperature it breaks up into soluble and insoluble fatty acids and glycerine, the first of which can be readily estimated by standard alkali or conversion into barium salt, or secondly by heating butter fat in a closed tub at 500 deg. F with a standard solution of alkali, afterwards adding a corresponding amount of standard acid, separating the insoluble fatty acids, and estimating the remainder of the acid by deci-normal soda solution, which acid of course corresponds to the soluble acid produced from the butter fat.

Seventh.—That the butter should be melted for some hours before taking the fusing point, and that this should, in every case, be taken on a rising temperature.

Mr. Wanklyn stated that in his experiments he has found traces only of butyric acid and Dr. Dupre's experiments, which seemed to give different results, showed a loss in the total of more than 4 per cent. He had been led to the conclusion that the amount of butyric acid increased with the age of the butter.

Dr. Dupré pointed out that this loss only occurred in his earlier experiments, when the silver tube leaked, but in his more recent ones, which he should shortly lay before the society, the loss rarely exceeded ½ per cent.

Mr. Allen fully agreed with Dr. Muter's method of stating the specific gravities and also with his directions to dry at 230 deg. F., instead of 212 deg.

Mr. Turner agreed with Dr. Muter as to the difficulty of washing, and pointed out that the so-called alcohol process which had been associated with his name was really a process which had been applied to the analysis of butter for a number of years past.

Dr. Stevenson said that his experiments led him clearly to the opinion that the fatty acids increased in amount as butter became stale.

After a few other remarks Dr. Muter, in replying, pointed out that he had estimated the free acidity of butter six months old and did not find it exceed ·2 per cent., which was within the limits of variations of samples. He also pointed out two other alternative methods of indirect estimation of the soluble acids. (1) Neutralizing with volumetric potash and then evaporating, igniting and taking the alkalinity of the residue, and (2) a method which he now understood had been previously mentioned by Dr. Dupré, using a standard alcoholic for saponification, and afterwards standard acid for separation of the fatty acids. The objections as yet to these two ways seemed to be (1) the tendency of neutral potassium sulphate to decrepitation and consequent loss, and (2) the difficulty of standard solution in spirit rapidly altering in strength.

NOTES ON THE DETECTION OF ALUM IN FLOUR AND BREAD.

By J. Alfred Wanklyn.

The want of a method for the estimation (or even of the detection) of the sulphuric acid which forms part of the alum put into flour and bread has been felt by analysts.

Owing to the existence of sulphur in gluten to the extent of about one per cent., sulphuric acid makes its appearance in the ash obtained on calcining flour and bread, and, *as I have shown, the sulphuric* acid of the alum is overwhelmed by that naturally present

in the ash of flour and bread. It is, therefore, to no purpose to make estimations of the sulphuric acid in the ash of alumed bread.

From some experiments recently made in my laboratory, I have been led to seek for the sulphuric acid in the cold aqueous extract of flour.

The major part of the mineral matter of flour goes into the cold aqueous extract, whilst the total weight of the extract is only some five per cent. of the flour. Before determining the sulphuric acid in the extract I coagulate the soluble gluten and remove it by filtration.

RETAILING MILK IN THE STREETS.

The question has arisen in more than one instance recently, whether an itinerant vendor of milk can be fined for refusing to serve an inspector under the Food and Drugs Act, or, in other words, whether a milkwalk may be considered either "premises," or "a shop," or "stores," and whether a house-to-house delivery of milk involves "exposure for sale."

To those interested in the question, we commend the following extracts from two letters, addressed respectively by the Home Office, and the Local Government Board, to the Wandsworth Board of Works, in reply to an application from that body for an authoritative interpretation of the law.

Mr. Cross, says, that "having consulted the chief magistrates of the Police Courts "of the Metropolis, he is of opinion that Sec. 7, of the Act 38 and 39. Vic., cap. 63, "applies when a vendor 'exposes to sale,' *anywhere*, or *has on sale* by retail in any shop "or stores. 'He,' however, recommends that a case be stated for the opinion of one "of the High Courts of Justice."

The Local Government Board, referring to a case in point, say: "If the milk was "retailed at the corner of the street to all passers by, it was exposed for sale, and such "exposure may perhaps be held to bring the case within the statute, but if it was being "delivered from house-to-house, the case may be different."

The Board, however recommend, that "before any amendment of the existing law is proposed, the judgment of the High Court of Justice should be obtained."

THE PREPARATION OF THE FERROUS PHOSPHATE OF THE PHARMACOPŒIA.

By Rees Price.

(Pharmaceutical Journal, 3rd Series, No. 297. 1876.)

Mr. Rees Price's experiments, appear to show that the Pharmacopœia process of making ferrous phosphate by means of ferrous sulphate, sodio phosphate, and sodic acetate, is one which may be uttended with a loss of one-fourth of the phosphate of iron, and that by using instead of acetate of soda, or ascetic acid, an excess of phosphate of sodium no loss occurs. He therefore suggests as a substitute for the process of the British Pharmacopœia the following:—

Granulated Ferrous Sulphate	224 grains
Sodic Phosphate	660
Cold distilled water	12 ounces.

A. W. B.

DR. LETHEBY.

We have to announce with extreme regret—a regret which will be shared by our readers—the death, somewhat suddenly, of Dr. Letheby. He had been unwell for some weeks, his complaint being we believe, inflammation of the lungs; but he was expected to be present as a scientific witness in a case at the Richmond Petty Sessions on the 29th inst. At the last moment, however, a telegram was received notifying his decease.

Dr. Letheby was too well known in the chemical world, to require any lengthened obituary notice at our hands.

We may however, mention, that he was an early Member of the Chemical Society; that he took his M.B. degree in 1843, became Ph.D., and M.A. in 1858; that amongst the numerous appointments which he had held, were those of Medical Officer of Health, and Public Analyst for the City of London; and that he was the author of numerous scientific and hygienic works. He died in his sixtieth year.

A NOVEL READING OF THE SALE OF FOOD AND DRUGS ACT.

AT Westminster, Henry Fielding, a milkman, of 15, Lower Symonds Street, Chelsea, appeared in answer to an adjourned summons, charging him with selling, to the prejudice of the purchaser, some milk which was not of the nature, substance, and quality demanded. Mr. Pemberton, barrister, appeared for the prosecution; and Mr. Symth, solicitor, for the defendant. The adulteration was not in dispute, but the summons being under the 6th section of the Adulteration of Food Act, and the inspector admitting that he purchased it solely for the purposes of analysis, it was asked whether the sale was to the prejudice of the purchaser. Mr. Pemberton said that if he proved that the article was not only different from the article demanded, but inferior in quality, the purchaser was prejudiced and an offence committed. Mr. Smyth said it was his duty to submit that the complainants had not proved their case. The proceeding was under a penal statute, and he was quite sure the magistrate would look at the statute strictly and give effect to it strictly. The word "prejudice," now appeared for the first time in an Adulteration of Food statute. He contended that it was introduced to enable any person buying food *bona fide* to have it analyzed, and to prevent an army of informers springing up. Mr. Pemberton contended that the purpose for which the article was bought was no part of the inquiry. Mr. Arnold said he could not tell what the Legislature intended by the words; but, as they were in the Act, they must have some meaning. Mr. Pemberton said that if any one paid more for an article than it was worth, it was to his "prejudice." Mr. Arnold said it was a very nice point and required consideration. He had read the Act very carefully since he had adjourned the case, but he should like to consider the matter further, as he was much struck by Mr. Pemberton's argument that the prejudice of the purchaser must mean a loss to the pocket of the purchaser. He should adjourn the case and consider his judgment. Another summons, in which the same principle was involved, was also adjourned.—*Times*.

THE ANALYST.

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THE ANALYST.

ORGANIZATION AMONGST CHEMISTS.

The importance of some organization amongst actual practising Chemists (as distinguished from amateur and theoretical ones) whereby really efficient men may acquire a status which the public can recognise, and thus be able to know, with some amount of certainty, whether in cases of importance, the person consulted is really a Chemist of ability or only a Chemist self-styled, has long been recognised, and lately has led to a considerable amount of discussion amongst Chemists who, as part of a body, have suffered in reputation from the absurd blunders of a number of empirics who have usurped the name of Chemist.

That such an organization, if fairly formed, would be productive of the best results cannot be denied, and it is, therefore, with considerable regret that we learn, as we go to press, that a meeting is being called for the purpose of considering the subject, the invitations to which appear to have been issued on some principle of selection, to which we have not got the key. We have received some correspondence on the subject from Chemists of acknowledged position who have not been invited, but in the present embryo state of the question we think it wiser to withhold it.

ON THE DETERMINATION OF QUININE.

By A. H. Allen, F.C.S.

Read at a Meeting of The Society of Public Analysts, Feb. 16th, 1876.

Being desirous of testing the accuracy with which prescriptions were dispensed in Sheffield, I recently had some mixtures made up of which Sulphate of Quinine was the principal constituent, solution being effected in the usual way by the addition of dilute sulphuric acid, and the mixture being sweetened by an admixture of simple syrup.

One of the prescriptions was arranged to contain 2 grains, and another 5 grains per ounce, of Sulphate of Quinine.

The method adopted for the estimation of Quinine in the above mixtures, has no claim to novelty, but experience having shown it to possess certain advantages, and to be susceptible of very considerable accuracy, besides being applicable to the estimation of quinine under a variety of circumstances, I have thought it worth while to record my results in detail.

In brief, the method employed consists of the concentration of the solution to a small bulk, addition of ammonia in moderate excess, agitation of the liquid with ether, and removal and evaporation of the etherial solution.

The concentration of the solution appears to be of secondary importance except with regard to the economization of ether.

As a rule, I prefer to manipulate on 200 to 250 fluid grains (12 to 15 c.c.), of solution, concentrating the liquid to about that bulk if necessary. The concentrated liquid is introduced into a long tube or cylinder, of a capacity of about 800 or 1000 gr., furnished with a tightly fitting cork or stopper.

Enough ammonia is then added to leave a distinct odour of the gas, and then a volume of ether about equal to that of the liquid already in the tube. The cork or stopper is inserted, and the tube vigorously agitated for a minute or two. When brought to rest, the ether and aqueous liquid usually separate rapidly. (Separation is often facilitated by cooling the tube in a stream of water. In warm weather this precaution should always be taken, to prevent loss of ether from the ebullition which sometimes occurs spontaneously on opening the tube). If the separation is difficult or imperfect, it may be induced with certainty by a further addition of ether and subsequent agitation.

When the separation of the ether and water* is complete, the former is removed by a pipette † to a small weighed beaker, and the latter is shaken up with a further quantity of ether in a similar manner. It is seldom necessary to agitate with ether a third time, the amount of Quinine thus extracted being rarely weighable.

The etherial solution of the Quinine when evaporated to dryness on a water-bath, leaves the alkaloid in a solid weighable state.

I at first supposed that the Quinine obtained by the evaporation of the etherial solution, would exist as trihydrate (C^{22} H^{22} N^2 O^2 + 3 H^2 O); the precipitate by ammonia being stated to possess that composition. Further research, however, has conclusively proved this assumption to be erroneous, as the following experiments show.

A sample of Howard's Sulphate of Quinine was completely analysed. The water was determined by drying at 110 deg. C., the sulphuric acid was precipitated as Ba SO , and the quinine was determined by the above described process, viz.: addition of ammonia and agitation with ether. It was conclusively proved that agitation of the ammoniacal solution with ether removes the *whole* of the Quinine, the aqueous liquid showing no fluorescence when strongly acidified with sulphuric acid, and giving no green colour with the bromine and ammonia test.

The Sulphate of Quinine in question gave the following results. For convenience of comparison, I have also stated the percentage composition of crystallized sulphate of quinine, containing 7 H^2O, and 8 H^2O. The freshly prepared salt is *said* to contain 8 H^2O, but practically that amount of water is not met with, owing to the rapid efflorescence which occurs.

It will be seen that the sample in question gave results agreeing very closely with the composition of the 7-atom hydrate. (See Table foot of next page.)

The mean of the indirect estimations of Quinine, obtained by subtraction of the sum of the percentage of water and sulphuric acid from 100.00, is 3.31 per cent., less than the mean of the direct estimations by agitation with ether.

The known hydrates of Quinine have the following percentage composition as compared with the residue from the ether.

	Quinine.	Water.
Trihydrate ($C^{20}H^{24}N^2O^2$ + 3 H^2 O)	85·71 per cent.	14·29 per cent.
Monohydrate ($C^{20}H^{24}N^2O^2$ + H^2 O)	94·74 ,,	5·26 ,,
Ether Residue	95·72 ,,	4·28 ,,

* Cinchonnia and other alkaloids insoluble in ether, are indicated here at the junction of the two fluids, as described by Mr. W. W. Stoddart. Magnesia partially remains as a flocculent precipitate in the aqueous solution.

† The pipette should be furnished with a piece of narrow india-rubber tubing, so as to allow the eye to be brought into a convenient position for observing the progress of withdrawal.

It will be seen, therefore, that the ether residue contains about one per cent. less water than corresponds to the monohydrate.

In two of the above estimations of Quinine, the alkaloid was determined by concentrating the filtrate from the sulphate of barium precipitate, adding ammonia and shaking with ether. In the other cases the quinine was determined in separate portions, cane sugar being added in two instances. Of the three experiments giving upwards of 77·9 per cent. of residue, one was made in the $BaSO^4$ filtrate, and two in separate quantities, of which one contained sugar.

It appears, therefore, to be fully established that the etherial residue is of constancomposition, approximating to that of the monohydrate of quinine. Crystallized sulphate yielding 77·59 per cent. of residue, the amount of the former can always be found by multiplying the weight of the residue by $\frac{100 \cdot 00}{77 \cdot 59} = 1,289$.

If the quinine sulphate has undergone efflorescence of course the amount will be over-estimated. The crystallized salt is liable to lose water till it approximates to the composition of a 4-atom hydrate. If the salt used have really this composition, and the ether residue be multiplied by the above factor, the calculated factor will be 106·6 per cent. of the true amount. It is evident, therefore, that the results are liable to be in excess of the truth.

As an example of the accuracy of which the process is capable in practice, I may quote the following results obtained from the analysis of a sample of sulphate of quinine which had been very much exposed to the air, and which, therefore may be assumed to have possessed a composition approximating to that of the 4-atom hydrate. Unfortunately neither the water nor sulphuric acid was actually determined. It will be observed that most of the estimations were made on very small quantities, and that the substance obtained is of less weight than the substance sought, instead of greater weight, as is usual in analysis. The addition of a large excess of ammonia was not found to affect the accuracy, and equally good results were obtained by the use of soda. A considerable quantity of cane sugar was added to the solution in each case.

	Water.	H^2SO^4	QUININE. Calculated.	QUININE. Found.
$(C^{20}H^{24}N^2O^2)\,^2H^2SO^4 + {}^8H^2O$ (=890)...	16·18	11·01	72·81	
$(C^{20}H^{24}N^2O^2)\,^2H^2SO^4 + {}^7H^2O$ (=872)...	14·45	11·24	74·31	
Experimental Results:—				
1	14·18	11·35	...	77·93
2	14·41	11·30	...	77·92
3	...	...	...	77·14
4	...	...	...	77·45
5	...	...	...	77·05
6	...	...	...	77·73
7	...	...	...	77·91
Mean	14·395	11·325	74·28	77·59

DETERMINATIONS OF SULPHATE OF QUININE IN SOLUTIONS CONTAINING MUCH CANE-SUGAR.

Exp.	Quinine Sulphate taken.	Ether Extract.	= per cent.	× 1·289 = 7 atom hydrate.	× ·938 = 4 atom hydrate.	
1	2 grains	1·61 grains	80·5	103·7 per cent.	97·3	per cent.
2	2 "	1·66 "	83·0	107·0 "	100·4	Mean
3	3 "	2·49 "	83·0	107·0 "	100·4	100·03
4	10 "	8·21 "	82·1	105·9 "	99·3	
5	3 "	2·47 "	82·3	106·2 "	99·6	
6	3 "	2·49 "	83·0	107·0 "	100·4	
7	3 "	2·51 "	83·6	107·7 "	101·0	
Mean.	......	......	......	106·36 per cent.	99·71	per cent.

The above are *all* the determinations of quinine which were made on the sample in question. Experiments 1, 2, 3 and 5, were made with a very large excess of ammonia; experiment 4 with a slight excess. In experiment 6 soda was substituted for ammonia. In experiment 7 a large excess of sulphuric acid was employed to dissolve the Quinine, and the solution was evaporated until considerable charring of the sugar had occurred. The ether residue was somewhat coloured.

The above results clearly show that the method is fairly accurate, and the results remarkably constant, considering the small amounts employed in each experiment.

Of six mixtures containing sulphate of quinine and simple syrup, which were made up by druggists in Sheffield from a physician's prescription in the usual way, four were found by the above process to contain the prescribed amounts within reasonable limits of variation, while in two, the amounts of sulphate of quinine found were respectively about $\frac{2}{3}$ and $\frac{3}{4}$ of the prescribed quantities.

I next tried if the process was applicable to the estimation of the quinine in the citrate of iron and quinine. This preparation is stated in the British Pharmacopœia to yield on addition of ammonia, a precipitate of quinine amounting to 16 per cent. of its weight. There is no mention made of any washing to which the precipitate is to be subjected, and no directions are given as to the mode of drying. As a matter of fact an exceedingly gentle heat causes agglomeration of the precipitate, and prevents its removal from the filter. In consequence of the solubility of quinine even in cold water, even careful washing causes a perceptible difference in the result.

In fine, the Pharmacopœia instructions are very imperfect. On this account, I estimated the total quinine in a sample of Howard's citrate, by precipitating the solution with a slight excess of ammonia, rinsing the precipitate off the filter and evaporating the rinsings and drying the residual quinine at 100 deg. C. The filtrate from the ammonia precipitate was concentrated, and the quinine extracted by agitating with ammonia and ether. In one experiment, the precipitated hydrate of quinine was washed with cold water, in the other it was left entirely unwashed. The results were :—

	Unwashed.	Washed.
Precipitated Quinine	17·71 per cent.	15·13 per cent.
Ether-residue from filtrate	·83 "	1.32 "
" " washings	none	
	18·54	16·45

According to the above results this sample of citrate comes up to the British Pharmacopœia standard of yielding 16 per cent. of precipitated quinine, if the precipitate be left unwashed, but washing brings it below the proper amount. Two experiments were made by treating a strong solution of the citrate with excess of ammonia, and then agitating with ether in the usual way, when I obtained 16·35 and 16·40 per cent. of ether residue, a result which shows a very close accordance with that previously obtained. The ether process is remarkably easy of execution in the case of the citrate of iron and quinine, not requiring more than some twenty or thirty minutes for its completion, and I think it would advantageously replace the present unsatisfactory and badly-detailed Pharmacopœia process.

I have also tried the applicability of the ether process to the determination of the Quinine in the official wine and tincture, but the results were somewhat in excess of the truth, owing to the presence of foreign matter of the orange taken up by the ether.*

On the whole, it is evident that the ether process is capable of giving results which, under favourable circumstances, are strictly accurate, and in others it leaves the quinine in a convenient and nearly pure state for further examination. As my object was primarily to effect the accurate determination of quinine in the presence of sugar only, I have not worked out exhaustively the problem of estimating it in complex liquids, and have rather aimed at the determination of the *total alkaloid* present than that of the actual *Quinine*, as distinguished from other cinchona bases.

My acknowledgments are due to Mr. L. N. Lean who has given me valuable assistance throughout the investigation, and has personally performed many of the manipulations.

DISCUSSION.

Dr. Muter said that certainly the process employed by Mr. Allen was a good one, and he had had considerable experience of it. It was a process invariably taught in the South London School of Pharmacy, as the best method of separating the alkaloids from scale preparations, with this difference, that there chloroform is preferred to ether; because with ether quinine and quinicine only are extracted, whilst with chloroform you also get cinchonine and quinidine. This is important, as the chemist might have used unwittingly quinine containing cinchonine. Instead of weighing the ether residue in estimating quinine he considered it preferable to either get it as a definite neutral sulphate, or to precipitate it as herapathite, the latter being very constant in composition, one part dried at 212 representing ·565 of quinine. In the examination of orange wine for quinine, the acid liquid should be first washed with ether, which removes matters soluble in that liquid other than alkaloids. He had frequently applied this process to the detection of quassine and gentianine in supposed pure quinine bitters. The agitation of the acid solution with ether or chloroform, as a rule, separates bitter principles and glucosides, and as far as he knew only one alkaloid, viz. colchicine, comes out to ether in the presence of an acid. A process of titration for the estimation of emetine in ipecacuanha is given in his (Dr. Muter's) book on Pharmaceutical Chemistry, which is very rapid and simple, and might be easily applied also to quinine in a mixture.

* The discussion on the paper having elicited valuable suggestions from several chemists, respecting the determination of the alkaloid in the wine and tincture of quinine, I think it better to reserve the further description of my experiments till I have had the opportunity of supplementing them.—A.H.A.

Dr. Stevenson said that some time ago when investigating the strength of quinine wine, he had successfully used the process of precipitation by ammonia, and extraction with ether, as described by Mr. Allen. The wine was merely boiled so as to drive off, the alcohol, and not concentrated to such an extent as the author of the paper had described; but four or five shakings with ether were practised. Dr. Stevenson had found that by using a quinine salt of known composition, and calculating on the assumption that the ether residue was a monohydrate, satisfactory results were obtained. Indeed, he thought he had seen it stated on good authority that the ether residue was a monohydrate of quinine. There was some doubt respecting the true formula of disulphate of quinine. The B.P. assigns to the salt 7 molecules, the French codex, 7½ molecules, and the U.S. Pharmacopœia, 8 molecules of water. It was doubtful whether the salt contained usually 7 or 7½ molecules of water, and it appeared to be pretty certain that it did not contain 8 molecules. The commercial article is perfectly dehydrated by exposure in the water bath, and contains about 14 per cent. of water as stated in the B.P., but being a very efflorescent salt, the percentage of water might be very much less than the above quantity.

Dr. Dupré enquired if Mr. Allen had tried the volumetric estimation of quinine by means of a standard solution of the double iodide of potassium and mercury, which was said to give excellent results? He congratulated Mr. Allen on the courage he had displayed in raising a discussion on such a subject, remarking that his own experience showed that a considerable amount of adulteration was practised in relation to drugs and medicines (*i.e.*, if the leaving out of an appreciable proportion of the active agent is to be considered adulteration).

He had noticed, moreover, that chemical compounds, such as sulphate of quinine hydrochlorate of morphia, iodide of potassium, &c., &c., were nearly always found to be pure wherever purchased, whereas all compound drugs and medicines which should contain a certain definite proportion of an active ingredient, were frequently deficient in that ingredient, and must therefore be looked upon as adulterated.

Mr. Wanklyn made a few remarks.

Mr. Thomson drew attention to some of the results which he had obtained in the analysis of compound medicines.

In replying,

Mr. Allen said that he made no claim to having originated the process, though he believed the extent to which it was capable of giving accurate results had not been previously investigated. With regard to Dr. Muter's valuable suggestion that accurate results might probably be obtained from the wine and tincture of quinine, by agitating first in an acid solution, he might say that he had observed that quinine was absorbed by ether, from acid solutions (probably as sulphate), to a sufficient degree to vitiate the results; but if chloroform be substituted for the ether, as suggested by Dr. Muter, he had no doubt the desired object would be effected. Mr. Wanklyn's suggestion, that the actual quinine in the ether residue, could be ascertained by titration with standard acid, seemed admirable, especially if some acid soluble in alcohol were employed.* As to the temperature of dehydration of quinine sulphate, he had employed 110 deg. C for the purpose, but it was interesting to learn from Dr. Stevenson, that the salt became anhydrous at 100 deg. C. Mr. Allen did not at all contend for the presence of eight, or even seven and a-half atoms of water in the crystallized sulphate. He had been merely interested

in the water indirectly, and quite agreed that more water than corresponded to seven atoms was not met with in practice. As far as he could ascertain, the existence of the monohydrate of quinine had previously been doubtful, and the dihydrate was apparently entirely new.† For the estimation of the iodide of potassium in the medicines he had recently condemned in Sheffield (and which merely contained aromatic spirits of ammonia in addition), Mr. Allen said he had precipitated one quantity as iodide of silver, after acidifying with nitric acid, and another in the original solution, by ammonio-nitrate of silver. The agreement in the weight of the two precipitates proved the freedom of the iodide of potassium employed from any sensible admixture of chloride, bromide, or iodate.

LIQUOR AMMONIÆ ACETATIS, B.P.,

By J. Thresh, F.C.S.,

(Pharmaceutical Journal, 3rd Series, No. 301, 1876, *p.* 787.)

Mr. Thresh comments upon the varying strength of Liq. Amm. Acet.; he analysed seven samples, three of which were purchased from wholesale, and four from retail chemists, with the following results (No. 1 was prepared by himself, Nos. 5, 6, 7 and 8 were concentrated preparations labelled as stated)—

No.	Re-action.	Sp. Gr.	Action of SH_2.	Per Cent. of Ammon. Acet.
1	Neutral	1·016	No Colour ...	6·9
2	"	1·016	Slight Colour	7·0
3	Strongly Alkaline	1·015	"	6·5
4	Alkaline... ...	Not taken	None ...	4·6
5 (1·2)	"	1·018	Slight Colour	7·9
6 (1·5)	"	1·014	"	5·8
7 (1·7)	"	1·011	Deep Colour	4·9
8 (1·7)	"	1·015	Slight Colour	6·5

Mr. Thresh thinks that in the next edition of the B. P. the solution should be made with solution of ammonia instead of with carbonate, that the characters, tests, &c., should be added, and that it should be directed to be kept in green glass bottles to avoid contamination with lead.

A. W. B.

PERSIAN OPIUM.

Mr. W. D. Howard [Pharmaceut. Journal, 1876, No. 298, p. 720,] has recently analysed a sample of Persian opium. The *undried* substance yielded—

	Per cent.
Morphine Crystallised from alcohol ...	10·40
Codeine (anhydrous)	0·29
Narcotine	2·50
Thebaine	0·57
Cryptopine	0·09
Papaverine	trace

A. W. B.

* Since the above paper was read I have obtained very encouraging results by titration.—A. H. A.

† The description of the elements proving the existence of these hydrates is omitted from the present paper.

THE DETECTION OF THE COLOURING MATTERS OF LOGWOOD, BRAZIL WOOD, AND COCHINEAL IN WINE,

By A. Dupré, Ph. D., F.R.S.

Read at the Annual Meeting of the "Society of Public Analysts," held January 26th, 1876.

Logwood, Brazil Wood, and Cochineal are said to be frequently used for imparting colour to wine, though I must confess that I have never found them in any wine I have examined. It is however but fair to add that until recently I knew of no, fairly reliable, method for detecting the presence of two at least of the above colouring matters, supposing them to have been added for the purpose of modifying the colour of a naturally red wine. Sorby's experiments have been made with fresh solutions of the colouring matters experimented on, and as these matters when in solution change to some extent in process of time, his experiments cannot be safely used for the examination of a wine without some further investigation. The following simple process, based on experiments made with solutions about a year old, will however, I believe, answer all requirements.

The natural red colouring matter present in wine* is incapable, or almost incapable of dialysis, whereas the above colouring matters dialyse, comparatively speaking, readily In order therefore to test a wine, we simply set it to dialyse for two or three days when, if it be pure,† a trace only of the colouring matter will be found to have passed through the dialyser, and what little has passed will have the colour of the wine very much diluted. If, however, the wine contains any of the above mentioned colouring matters the water outside the dialyser will be found of a marked yellow or brownish yellow colour, very different from that of the wine inside the dialyser. This solution may now be used for obtaining the chemical, and optical reactions of the colouring matter free or almost free, from the interfering influence of the natural colouring matter of the wine. In the case of logwood and brazil wood, these tests do not yield the same marked and characteristic results in the old, which they yield in the fresh solutions. I will therefore, not attempt to describe them, but would rather advise everyone who intend making such examinations to keep some infusion or tincture of the woods, of known age, in his laboratory, so as to be able to compare their respective reactions directly with the inspected colouring matter obtained from the wine. The colouring matter of cochineal yields however, three well marked absorbtion bands when its ammoniacal solution is examined by the spectroscope, and by means of these bands the presence of even a small proportion of this colouring matter may be recognized in the wine itself. The portion dialysed, yields these bands however somewhat more sharply. Other colouring matters said to be sometimes employed in the manufacture of wine, may perhaps be separated by similar means, and I hope some members of this Society may be induced to try experiments in this direction. In conclusion, I would remark, that the parchment paper to be used in these experiments, should be of good substance, and that great care should be taken in fixing it over the dialyser so as to prevent the setting up of capillary action between the folds of the paper, by means of which, portions of the contents of the dialyser pass over into the outer vessel producing effects which may be mistaken for true dialysis.

* I have examined Claret, Red Rhine Wine, and Australian Wine, and Port Wine, and have no doubt most other natural Red Wines will behave in a manner similar to these.

† The natural colouring matter of a pure wine will not dialyse, from this however it does not follow that a wine, the colouring matter of which does not dialyse, is therefore pure. The colouring matter from Rhatany Root for example I find does not dialyse.

ACCURACY IN DISPENSING.

The panic created by the investigation into the manner in which Dispensing Chemists "make up" the prescriptions presented to them, which, in the course of his official duties, Mr. Allen, the Analyst for the Borough of Sheffield, recently instituted, will be fresh in the memory of our readers, but the sequel may not be so widely known. Mr. William Thomson, of the Royal Institution, Manchester, determined to extend the range of the examination which Mr. Allen had commenced, and, with that view, had two prescriptions made up in a large number of towns and cities in different parts of England and Scotland. The results of this investigation, which were necessarily of considerable interest, Mr. Thomson proposed to communicate in the form of a Paper, "On the degrees of Accuracy displayed in the Dispensing of Physicians' Prescriptions by Druggists in different Towns throughout England and Scotland."

This Paper has rather a curious history. It was intended to be read at a Meeting of the Pharmaceutical Society on the 1st of March, and an explicit announcement that it would be so read appeared in the Pharmaceutical Journal of February 26th, but notwithstanding such official notification, the Paper was not read before the Pharmaceutical Society either on the date named or on any other occasion. The reason for the rejection of the Paper was given, somewhat tardily, in the Pharmaceutical Society's Journal of March 11th. It appears that "when the nature of the Paper became known the trivial "and insufficient nature of the grounds upon which conclusions were drawn was so manifest, that it was decided not to accept the Paper," even though the acceptance of the Paper had been already officially announced.

Mr. Thomson, however, found an audience if not in Bloomsbury Square, and read his Paper before the Manchester Philosophical Society just a week after it was intended to be read before the Pharmaceutical Society. The strangest point in the affair is, however, that whilst Mr. Thomson's Paper was rejected by the Pharmaceutical Society, and ignored by its organ, the "Chemist and Druggist" published it *in extenso*, having received the manuscript at its own solicitation.

It should be a matter of congratulation to the trade that they possess in the "Chemist and Druggist" an organ which does not fear a fair discussion, but honestly opens its columns to both sides.

POTASSIUM IODIDE.

Mr. Thos. F. Best, F.C.S., [Pharmaceut Journal, 1876, No. 298, p. 720] has analyzed some samples of commercial iodide of potash, and calls attention to the presence of an excess of alkali, chiefly in the state of carbonate.

			per cent.
No. 1 contained	...	...	5·44
„ 2 „	...	...	5·35
„ 3 „	...	...	2.32
„ 4 „	...	...	1.78
„ 5 „	...	...	·53

From the author's practical experience he considers that commercially pure iodide should not contain more than from 15 to 20 per cent. ?

A. W. B.

THE PREPARATION OF DEXTRINE-MALTOSE (MALT SUGAR) AND ITS USE IN BREWING.

By Wm. Geo. Valentin, F.C.S., Royal College of Chemistry, South Kensington.

Abstracted from "Journal of Society of Arts," March 24th, 1876.

The author describes some improvements made by himself and Mr. Cornelius O'Sullivan, in the preparation of a sugar for brewers' use.

In order to show the advantage of dextrine-maltose, the author first dwells upon the composition of malt, showing that by a study of the constituents contained in malt before and after infusion, in connection with those contained in the fermented beer, much additional insight into the brewing process may be gained.

The published analysis of malt are, upon the authority of Mr. O'Sullivan, not to be relied upon.

Oudemans states that malt contains 8 per cent. of dextrine, O'Sullivan cannot find any; again, the amount of sugar is usually set down at from ·4 to 1 per cent; O'Sullivan finds from 16 to 20 per cent. About half of this is due to the transformation during the malting process of starchy matter, the remainder of the sugar is ready formed in barley, and differs from the one produced by malting.

The starch of barley contains a carbohydrate of the type having a laevo-rotatory action on polarised light. Kühnemann calls this body "Sinistrin," but from its general character, O'Sullivan is inclined to think that it is "Inulin."

The following table gives the detailed composition of two samples of pale malt, every item of which has been estimated directly and not by difference:—

		Malt No. 1.		Malt No. 2.
Starch		44·15		45·13
Other Carbohydrates (of which 60 to 70 per cent. consist of fermentable Sugars) Inulin (?), and a small quantity of other bodies soluble in cold water		21·23		19·39
Cellular matter		11·57		10·09
Fat		1·65		1·96
Albuminoids—				
(*a*) Soluble in alcohol of sp. gr. ·820 and in cold water	·63		·46	
(*b*) Soluble in cold water and at 68° C ...	3·23		3·12	
(*c*) Insoluble in cold water but soluble at 68° to 70° C	2·37		1·36	
(*d*) Insoluble at 68° to 70° C, but soluble in cold water (albumin proper)	·48		·37	
(*e*) Insoluble in cold water and at 70° C ...	6·38		8·49	
	——	13·09	——	13·80
Ash		2·60		1·92
Water		5·83		7·47
		100·12		99·76

When ground malt is submitted to the mashing process, certain of the albuminiod bodies contained in the malt act upon the starch, and the latter is dissolved.

The wort, therefore, contains the transformation products of the starch, principally dextrine maltose of the other carbohydrates, the soluble albuminoids, the soluble portion of the ash, and a little soluble fat.

Boiling with hops removes a portion of the albuminoids, but the starch products are t slightly altered.

When the boiled hopped wort is subsequently submitted to the action of yeast, the carbohydrates, other than those derived from starch, yield alcohol first, and the portion which is fermentable (60 to 70 per cent.) disappears almost altogether, and there remains in the beer, when the first stage of the fermentation is over, and when it is fit to go into the casks, the alcohol and a portion of the carbonic acid derived from the carbohydrates other than starch, and also from a portion of the products of the transformation of the starch itself, effected by the ferments. Hence the whole of the dextrine, a considerable portion of maltose, the remainder of the albuminoids, the soluble matter of the hop, and a few other constituents are left for after fermentation.

In order to understand the part which the dextrine and maltose play in the after history of the beer, the author examined the constitution of a typical Burton Pale Ale, when the principal fermentation was finished. The sample showed an original gravity of 1063, and gave when finished and ready to be put into casks a distillate of spirit grains ·992, equal to 33·7 degrees of gravity lost. The unboiled wort of this beer, supposing it had been brewed from No. 1 malt and reduced to the above specific gravity, viz. 1063, after allowing for concentration on boiling, would contain in every 100 parts by measure the following solid constituents:—

Maltose	6·66
Dextrine	3·44
Other Carbohydrates, fermentable	3·30
Ditto unfermentable	1·48
Albuminoids	1·45
Ash, Phosphates, Sulphates, &c.	0·17
Total	16·50

After boiling with hop (and correction for loss by evaporation, so as to keep it at the normal original gravity of 1063) it was composed as follows:—

Maltose	6·66 per cent.
Dextrine	3·44
Other Carbohydrates, fermentable	3·80
Ditto unfermentable	1·00
Albuminoids	1·05
Hop extract	0·33
Ash	0·27
Total	16·55

Hence it follows that the fundamental constituents of the hopped wort had undergone but little change, when the principal fermentation with yeast was finished and the ale ready to be put into the cask, the beer contained:—

	Alcohol and solids in 100 parts.
Alcohol	4·48 sp. gr. ·992
Maltose	1·52
Dextrine	3·44
Carbohydrates fermentable	trace.
Ditto, unfermentable	1·00
Albuminoids	·66
Hop Extract	·33
Non-volatile Products of the Fermentation...	·47
Ash	·24
	7·66

If we examine the malt analyses given above, and suppose that during the mashing process the malt yielded an extract of 74 per cent., we perceive that the starch amounts to little more than *59·6 per cent.*; the maltose and dextrine in the wort to a little more

than 61 per cent. of the extract, the increase being due to the binding of water. This very closely corresponds to the theoretical percentage of these bodies, obtainable, if starch splits up, according to the equation:—

$$\underbrace{C^{18}H^{30}O^{15}}_{\text{Starch.}} + OH^2 = \underbrace{C^{12}H^{22}O^{11}}_{\text{Maltose.}} + \underbrace{C^{6}H^{10}O^{5}}_{\text{Dextrine.}}$$

that is, 32·15 per cent. of dextrine and 67·85 of maltose.

If the composition of the boiled wort given above be examined, it will be found that about 64 per cent. is fermentable matter. In all well conducted brewing operations, at the time of racking the beer, if the original gravity be determined, few instances will occur in which the amount of matter fermented is more than 64 per cent. of the original solid matter before fermentation. There may be cases in which this number is exceeded, as in old beers, in which the after-fermentation had taken place, or badly brewed beers, in which proper attention had not been paid to the mashing operation.

It is pretty well understood that if a pale ale, the worts of which had, say a specific gravity of 1063—1064, can be got into the cask when it is reduced by fermentation down to 1020—1021, things are going on rightly. The meaning of this is not far to seek. The wort would contain in every 100 parts, by measure, 16·5 parts by weight, or thereabouts of solid matter of the composition already referred to. The specific gravity of the finished beer being taken at 1021, the specific gravity of the spirit contained in the finished beer would be 992, or 8 less than 1000. The specific gravity of the finished beer, taken at 1021, the specific gravity of the beer without the alcohol would amount to 1029 (1021+8). This represents 7·6 per 100 of solid matter, or 16·5—7·6=8·9 of converted matter, and when expressed in percentage numbers=53·9, say 54 per cent., thus leaving still in the beer, as shown above, about 10 per cent. (on original extract) of fermentable matter. This matter is maltose, and it serves to keep up, by its slow and gradual fermentation, the condition of the beer in cask.

Malt being sweet, and it not being understood to what the sweetness was due, cane sugar, invert sugar, and glucose, or so-called saccharines of various kinds have been proposed as substitutes.

If cane sugar be submitted to the action of yeast, it will be found, if sufficient yeast be added, and the temperature of the mixture be maintained at from 20° to 30° C. that the whole of it ferments in four or five days, and yields 51 to 51·5 per cent. of alcohol, together with a certain proportion of succinic acid, glycerine, and other products. The residue left on fermenting a portion of the cane sugar always tastes acid and "thin;" the acid taste is no doubt due to the succinic acid, and the thinness to the peculiar sharp bodiless taste of the sugar.

If one-third of the malt extract in the pale ale mentioned above be replaced by cane sugar, the wort before boiling would then have the following composition:—

	Per 100 parts by measure.
Cane Sugar	5·57
Maltose	4·53
Dextrine	2·14
Other Carbohydrates, fermentable ...	2·20
Ditto, non-fermentable	0·99
Albuminoids	0·98
Ash	0·11
	16·52

After boiling with the hop it would contain—

	Per 100 parts by measure.
Cane Sugar	5·57
Maltose	4·53
Dextrine	2·14
Other Carbohydrates, fermentable ...	2·53
Ditto, non-fermentable	0·66
Albuminoids	0·70
Hop Extract	0·39
Ash	0·21
	16·73

The analysis is of a beer in which the same amount of hops was used as in the previous case. The numbers are before fermentation. It contains—

Cane Sugar	5·57
Maltose	4·53
Fermentable Carbohydrates	2·53
	12·63 in 16·73 parts.

i.e., 75 per cent. of fermentable matter.

Cane sugar can never be used as a substitute for malt in the brewing of keeping beers. Keeping, even for a short time, attenuates them so much, that all body and flavour are gone.

The next substance to be dealt with is the so-called "invert sugar." The analysis of two samples I have before me. They appear as semi-solid, straw-coloured, honey-like substances. No. 1 gave 85 per cent., and No. 2, 86·88 per cent. of solid matter. Hence 85 parts of cane sugar would go as far as 100 parts of No. 1; and 86·88 of cane sugar as far as 100 parts of No. 2; but 100 parts of cane sugar yield 105·26 parts of invert sugar.

	Per centage composition of two samples of so-called Invert Sugar. No. I.	No. II.
Cane Sugar	13	26
Invert Sugar	87	74
	100	100

Their value as substitutes for malt can be easily estimated from what has been said above upon cane sugar, and from the fact that invert sugar only yields from 48 to 49 per cent. of alcohol, by fermentation.

The next set of bodies are the so-called "saccharines," or glucoses, &c., produced by the action of sulphuric acid upon starch or starchy substances.

The following are analyses of five samples of saccharines from different makers:—

Sample No. 1.—Rather brown; very hard; English manufacture.
Sample No. 2.—Pale straw colour; softish; French manufacture.
Sample No. 3.—Rather white; somewhat hard; English manufacture.
Sample No. 4.—Rather white; somewhat hard; German manufacture.
Sample No. 5.—Whiter; somewhat hard; German manufacture.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Glucose	80·0	58.85	67·44	63·42	61·46
Maltose	None.	14·11	10·96	13·50	13·20
Dextrine	None.	1·70	None.	None.	None.
Neutral carbohydrates, with a little albuminoids	8·2	9·38	4·30	8·40	8·60
Ash	1·3	1.40	1·60	1.50	1·60
Water	10·5	14·56	15·70	13·18	15·20
Total	100·00	100·00	100·00	100·00	100·00
Total solid matter	89·5	85·44	84·30	86·82	84·80
Percentage of matter of use to the brewer ...	80·0	74·66	78·40	76·92	74·80

These analyses require little explanation, and very little comment of any kind.

The glucose is of the $C^6 H^{12} O^6$ type, and yields only 48 to 49 per cent. of alcohol, on fermentation.

The neutral carbohydrates are useless to the brewer, for although they increase the specific gravity of the beer, they are devoid of taste and "body-giving" properties. They, under no condition, yield alcohol, and cannot be converted like dextrine by the slow and gradual action of the beer into bodies capable of yielding this substance.

If the analyses of these saccharines be examined and compared with that of the malt-wort, it will be seen that they have only one constituent in common, viz., maltose, and this exists in the saccharines in such small quantity as to be of little consequence.

A slight consideration of the composition and properties of dextrine-maltose will show at once its great superiority over all other malt substitutes offered to the brewer.

It contains in 100 parts in round numbers:—

Maltose	67
Dextrine...	33
	100·0

Maltose yields the same proportional quantity of alcohol as cane sugar does, and the alcohol it yields is, in flavour, as far superior to the raw alcohol of the glucose of the saccharines, as that of fine malt whiskey is to potato spirit. In fact, the fine flavour of malt spirit is due to the fermentation of maltose, and that of the so-called potato spirit, to that of glucose. This is another reason why the saccharines have not come into more general use. There is far more yeast forming albuminoid matter in malt-wort than is required to ferment its saccharine constituents, and an addition of dextrine-maltose in varying proportions will have the additional effect of removing a further quantity of this yeast-forming matter from the beer before it goes into the casks.

In the manufacture of dextrine-maltose, when rice is employed it should be husked and finely ground. The rice-meal is first steeped in from 1 to 1½ times its weight of cold acidulated water, or in water not higher than 40° C, and thoroughly agitated by mechanical means. It is then gradually introduced into acidulated boiling water, in the proportion of 100 parts by weight of rice to 250 by weight of the latter, care being taken not to allow the temperature to fall much below 90° C. The amount of acid—by preference sulphuric—may vary. We employ from 1½ to 2 or 3 parts per cent. A dilute acid is preferable, for although the converting action is not quite so rapid, it proceeds much more regularly.

The vessel in which the rice-meal is converted consists of an ordinary mash tun, lined with sheet lead and provided with steam coils and a stirrer. As soon as the rice has become thoroughly diffused throughout the boiling water, a rapid conversion is observed. The liquid boils up briskly, and the steam has to be checked for a while to prevent its boiling over. This action is evidently owing to a chemical change. The rice-paste becomes rapidly thinner, when kept at a boiling temperature for about an hour or an hour and a-quarter. It is best and most expeditiously tes ed by neutralising a sample with baryta-water or chalk, filtering and examining the clear solution by means of the polariscope.

The conversion may be considered complete when the rotatory power is $+ 171°$ or thereabout, indicating two parts of maltose (rotatory power $+ 150°$) and one part of dextrine (rotatory power $+ 213°$), *i.e.*

$$\frac{2 \times 150° + 213°}{3} = 171°$$

By always infusing the same quantities of rice-meal and keeping up the same temperature, it is possible, after a few experiments, to dispense with the polariscopic determination altogether, and to obtain a liquor containing the proportionate quantities of dextrine and maltose, as they are found in malt-wort. The acid liquor is then carefully neutralised with good chalk to the extent of about 90 per cent., finishing off with milk of lime. This operation can be carried out with the greatest delicacy. It is preferred to leave the liquor, however, rather a trifle acid than alkaline. The strength of the liquor, after filtering off the grains, and the gypsum through Taylor's filtering bags, usually amounts to 1,115 to 1,125, or 30 to 32·5 per cent. of solid matter, *i.e.*, about double the strength or original gravity of malt-wort required for brewing strong ales. It is of a light amber colour and filters very readily. It is next evaporated either in an open pan, or with greater advantage in a vacuum pan, to a concentration of about 1,200, or about 52 per cent. of solid matter. A little more gypsum and a little flocculent albuminoid matter are at this stage best separated by filtration, and the concentrated liquor finished off in a properly constructed vacuum pan, or in an open steam-jacketed pan, provided with an agitator, till it acquires a stiff viscidity. It is then run off hot into forms, and cast into cakes of convenient weight, which on cooling, set hard, and are ready to be sent to the brewery. 78 to 80 per cent. of the starch in rice, in fact every particle, can be converted into dextrine-maltose.

The cost of manufacture is not more than 25s. to 30s. per ton.

R. H. H.

PROSECUTIONS UNDER THE SALE OF FOOD AND DRUGS ACT.

At Alfreton Petty Sessions Mr. Alfred Schofield, grocer, Market-place, Alfreton, was charged with selling ¼lb. of caper tea, on the 15th March, which was adulterated with mineral matter.—The prosecutor went into the shop of the defendant, and asked the assistant for ¼lb. of caper tea, which was supplied to him, for which he paid 1s. 2d. He divided it in three equal parts, and sealed the parcels. One he left, one was forwarded to the public analyst, A. H. Allen, and one he kept.—It was deposed by the analyst that he examined the tea, and found that it was adulterated with 8 per cent. of mineral matter, 6 per cent. of which was small stones rolled up in the leaves.—Mr. Schofield stated in defence that the tea was old stock, and was sold precisely as he bought it. It was not kept in the shop, and was only supplied when customers asked for it. He had learned since the information that it was often adulterated, but did not know that when he sold it.—Fined in the mitigated penalty of £5, which was paid.

The following is the First Case from Scotland, of milk adulteration, which has been remitted to Somerset House.

On the 11th of March James Mathie, Inverkip, was charged before Sheriff Smith, at Greenock, with having sold a quantity of milk of the quality known as skim, which was not of the quality demanded by the purchaser.

Mr. William McCowan, Public Analyst, deposed that he had analysed the milk referred to, and found that it contained at least 21½ per cent. of added water, and also 122 grains per gallon of added salt.

After hearing agents for both parties, the Sheriff expressed his opinion that it would be well to have another analysis of the milk, since the analysis was disputed; it would be desirable that the public should know whether they could rely upon their analyst. The sample was then ordered to be sent to the Commissioners of Inland Revenue.

The case was again called before Sheriff Smith, on the 6th of April, when the Inland Revenue Chemist's report was read, which was to the effect that considering the amount of decomposition which had taken place, they were of opinion that the milk had been adulterated with 24 per cent. of added water. They also found an excess of salt over and above that ordinarily found in genuine milk, to the extent at least of 80 grains per gallon. The Sheriff said, that as the evidence of Mr. McCowan had been fully borne out by the London chemists, he would impose a fine of £2 2s. with £3 3s. for expenses.

THE PRACTICE OF ADULTERATING BUTTER.—Frederick Dobell, butterman, of 68, Wellington-road, Kentish Town, was summoned by the vestry of St. Pancras for selling a quantity of adulterated butter.—It appears that the sanitary inspector went to the defendant's shop and asked for a pound of butter, which was served him, and he paid 1s. 4d. for it.—Dr. Stevenson, the public analyst, certified that in it there was 75 per cent. of substance other than butter.—The defendant said he had sold the butter as he bought it from the wholesale merchant. He paid 1s. 2½d. per pound for it and sold it at 1s. 4d Mr. Mansfield said he believed that for some time past persons had been sending bad butter from Holland.—It was mentioned that it was called "bosh." Mr. Mansfield ordered the defendant to pay a fine of £5 and 2s. costs. Thomas Lodge, butterman of 5, Prince of Wales-crescent, Kentish Town, was also summoned for a similar offence, and it was proved that the butter was adulterated 70 per cent.—The defendant made the same excuse as the last defendant, and was ordered to pay a similar fine, the magistrate stating that they could proceed against the merchants.

At the Clerkenwell Police Court, four persons were prosecuted under the Adulteration Act, with the following results: Alfred Willen, of 4, Corporation Buildings, Farringdon Road, was ordered to pay a fine of £3 and costs, or to be imprisoned for one month, for selling milk mixed with 30 per cent. of water; Alfred Coker, general dealer, 4, Clerkenwell Green, was fined 10s. and 2s. costs, or in default of payment seven days' imprisonment, for selling milk adulterated with 11 per cent. of water; John Ager, milkman, 150, King's Cross Road, fined £3 and costs, or one month's imprisonment, also for vending milk with 30 per cent. of water; and a penalty of 20s. and costs, with the alternative of fourteen days' imprisonment, was inflicted on Theodore Eden, of 3, Weston Street, Clerkenwell.

Richard Cheviles, cheesemonger, of Hackney-road, was summoned before Mr. Bushby, by the vestry of the parish of St. Leonard, Shoreditch, for selling as butter an article which was adulterated.—Mr. E. Walker, vestry clerk, supported the summons, and the defendant was represented by a solicitor whose name was not stated.—The purchase having been formally proved, the certificate of Dr. Stevenson, public analyst to the parish was put in, and showed that the article purchased as butter was adulterated with common fat, not butter fat, at least 50 per cent.—The

defendant, by his solicitor, said that he had purchased the "butter" of a salesman in Leadenhall Market, at the rate of about 14½d per lb., and sold it the same as he received it at 1s. 6d. per lb., and had no idea that it was adulterated. The defendant, called as a witness on his own behalf, admitted, however, that he did not think "real" butter could be sold for 1s. 6d. per lb., and further that he had no warranty from the salesman that it was butter. Mr. Bushby said the warranty would have been a protection to him. He considered the case made out, and inflicted a fine of 40s., and 2s. costs. The money was paid.

THE URBAN AND SUBURBAN MILK-CAN.—An instructive case was tried last Saturday at Bath, in which a milkman admitted that he carried two cans, the one containing pure milk, which he distributed in the suburbs, where there was a public analyst; the other a milk adulterated with at least 20 per cent. of water, which was disposed of in the city, because there was no such official there!—*Lancet*.

THE SALE OF FOOD AND DRUGS ACT.—William Lindsay Emmerson, M.D. Aberd., L.R.C.S. Edin., L.S.A. Lond., has been appointed public analyst to the counties of Leicester and Rutland for one year, vice Young, whose appointment has expired—10s. 6d. per analysis, minimum £70 for the year.

SOCIETY OF PUBLIC ANALYSTS.

THE next Ordinary Meeting of this Society will be held on Wednesday, May 3rd, in the "Meeting" Room of the Chemical Society, Burlington House, Piccadilly, at 6.36 p.m., when the names of the Candidates for admission as Members will be read to the meeting. After which various papers will be read and discussed.

At 6 p.m. on the date and at the place above named, and before the Ordinary Meeting, an Extraordinary Meeting will be held for the purpose of considering the desirability of making such a change in the name or style of the Society as shall indicate that its members do not consist exclusively of Analysts holding public appointments under the "Sale of Food and Drugs' Act;" but that, as is already provided in the constitution, "ALL ANALYSTS IN ACTUAL PRACTICE," are eligible for election as members.

NOTE ON THE ESTIMATION OF THE GRAVITIES OF FATS.

BY G. W, WIGNER, F.C.S.

THE small quantity of Butter received for analysis, especially in disputed cases, is frequently insufficient to fill even a small specific gravity bottle. In such cases the well known specific gravity "bubbles" may be used with advantage, even if the quantity of fat is as little as 200 grains.

By adopting the following mode of procedure, only one or two bubbles will be required.

Pour the filtered liquid fat into a test tube of suitable size, put in the bubble, cool the fat until the bubble just rises, then transfer the tube to a suitable water bath, and raise the temperature of the water very slowly until the bubble begins to sink, read the temperature at this time for comparison with genuine butter.

The following results will show the bubbles likely to prove most suitable.

Two bubbles were selected, the sp. g. of No. 1 was 899·7, of No. 2 895·7, both of course taken at 60 F. In a sample of Butter Fat which at 100° F had an "actual density" of 913 No. 1 bubble sunk at 131° F; No. 2 at 144° F. In another sample of fat, having an actual density of 911·3, No. 1 bubble sank at 123° F; No. 2 at 135° F.

THE ANALYST.

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THE ANALYST.

THE ANALYSIS OF BUTTER.

It is satisfactory to notice that the question of the analysis of butter which has been for some time pretty definitely settled amongst analysts generally, appears at last to be in a fair way of being understood by the Inland Revenue Chemists.

Some short time ago a prosecution was instituted by a Metropolitan Board against a dealer, who had sold a sample of butter, which was certified by the district analyst to contain foreign fat.

The analysis was disputed, and the sample was referred to Somerset House, and the chemists there, reported that the results were not inconsistent with those of genuine butter. Dr. Muter, Dr. Dupré, Mr. Wigner and others, confirmed the original analysis, but the *ipse dixit* of Somerset House was accepted and the case was dismissed.

Since then, another butter case has arisen, which has an interest of its own, from the fact that it was stated by the defendants' advisers that the sample on which he was prosecuted was part of the same butter which the Inland Revenue chemists had certified to be genuine, and in which the prosecution failed, and, as a matter of fact, the figures of the analysis of the two butters were substantially the same.

This case was also referred to the Somerset House chemists, who certified to even a larger proportion of foreign admixture than that found by Mr. Wigner. Thus according to this "final Court of Appeal," as it has been called, what is genuine butter one week contains at least 70 per cent. of foreign fat, the next

It is, however, "never too late to mend," and it is to be hoped, that the education of the Somerset House officials may not stop short at butter, but may extend, for instance, to milk, about the analysis and constituents of which they appear at present to have much to learn.

SOCIETY OF PUBLIC ANALYSTS.

An Extraordinary General Meeting was held at Burlington House on the 3rd inst., to consider the desirability of making such a change in the name or style of the Society as should indicate that its members do not consist exclusively of analysts holding public appointments under the "Sale of Food and Drugs' Act." A resolution proposing that the word "Public" be omitted from the title was moved and seconded.

An amendment to the effect that the name of the Society be not altered was then proposed and seconded, and after discussion was put to the vote and lost.

A second amendment that the matter be referred to the council for further consideration and report, was then proposed and seconded, and the original resolution having been by permission withdrawn, the amendment was put as a substantive motion and carried unanimously.

The ordinary meeting was then held.

The names of the following candidates for admission as members were read:—

Wm. Bettel, Public Analyst for Middlesboro'; H. C. Bartlett, Ph.D., F.C.S., 7, South Square, Gray's Inn; John Clark, Ph.D., Public Analyst for Glasgow, &c.; Otto Hehner, St. Catherine's House, Ventnor; A. Bostock Hill, L.R.C.P., L.S.A., 16, Moore Street, Birmingham; J. A. R. Newlands, F.C.S., 9, Mincing Lane; Wm. Thomson, F.C.S., Royal Institution, Manchester; R. P. Tatlock, F.R.S.E., F.C.S., Public Analyst for Glasgow; William Wallace, Ph.D., F.R.S.E., F.C.S., Public Analyst for Glasgow. After which the following papers were read and discussed:—

On an abnormal sample of new milk, by J. Pattinson.

Milk standards, by Alfred Hill.

The determination of the melting point of butter and other fats, by T. Redwood.

The next Meeting of the Society will be held on Wednesday June 14th.

MILK STANDARDS.

By Alfred Hill, M.D.

Read before the Society of Public Analysts at Burlington House, May 3rd, 1876.

As there is no more important article of diet than cows' milk, and as no kind of food is more subject to adulteration, it becomes a matter of the greatest importance to Public Analysts as well as to milk consumers, that a safe and proper standard of the quality of cows' milk should be generally accepted. Such a standard is a great desideratum on many grounds.

It is with a view to assist in the settlement of this *vexata quæstio* that I have ventured to make it the subject of a short paper, and the more particularly so in view of an opinion delivered by the Somerset House Chemists, to whom was recently submitted a sample of milk from Coventry, a portion of which I had analysed and pronounced skimmed. I have always considered in setting up a standard for my own guidance, that the analyses of genuine milk published many years ago by M. M. Henri and Chevallier, fairly represented the average quality of milk yielded by cows fed on different sorts of proper healthy food, they are as follows :—

	Normal Milk.	Fed on Beet.	Fed on Carrots.	Average.
Solids not Fat	9·85	10·38	10·25	10·16
Fat	3·13	2·75	3·08	2·99
Total Solids	12.98	13.13	13·33	13·15

and after a considerable amount of experience I find little reason to modify my opinion. According to the observations of Müller and Eisenstück, (acting for the Agricultural Society of Sweden,) quoted by Mr. Wanklyn in the Manual of Public Health, the milk of a herd of fifteen cows of different breeds contained on an average 12·8 per cent. of solids, and never once during an entire year contained less than 11.5 per cent. of solids. The highest percentage of solids observed on any day throughout the year was 14·08. "My own observations" says Mr. Wanklyn, "are completely in accord with the Swedish results, and it may be accepted as a well established fact, that cows' milk does not contain *less than* 11·5 *per cent. of solids*, and seldom less than 12 per cent. of solids." If this remark applies to a herd of several cows, and not to individual cows, I emphatically endorse it, and with a few rare exceptions I endorse it altogether, inasmuch as it is borne out by the results of the analyses I have made, many of which I produce in this paper.

Before giving the results of my general experience, and comparing them with those of other experimenters, I will quote the results of my analysis of the sample of milk before referred to, which on the 1st of March was submitted to me by the Inspector :—

Solids not Fat	8·67
Fat	2·47
	11·14
Ash	0·72

These results, or my opinion founded upon them, that cream had been abstracted b[illegible], the portion of the sample retained by the Inspector was sent to Somerset [illegible] nalysed by the Chemical Officers of the Inland Revenue, and at the [illegible] 1st of April, the following report from them was read.

"The sample of milk was received here on the 20th of March, from Mr. Inspector Richard Coombes.

The bottle was securely sealed.

We hereby certify that we have analysed the milk and declare the results of the analysis to be as follows:—

	per cent.
Solids not Fat	8·21
Fat	2·83
Water	88·96
	100·00
Ash	0.62

These results, according to our own experience, do not justify the conclusion that either cream has been abstracted from, or water added to, the milk.

The reasons for our coming to this conclusion may be briefly stated for the information of the Court and prosecution.

1st. The fat present in genuine milk varies very considerably, and in some instances we have found the proportion of Fat in milk, known to be genuine, as low as in the above sample. In this matter we speak from actual experience, having experimented upon numerous samples of milk obtained from various parts of the country.

These samples were milked from the cows in the presence of an officer of this department, and every precaution was taken to ensure accuracy, both in taking and analysing the samples so obtained. We may instance, as bearing directly on the present case, an average sample of milk which we procured from a Staffordshire dairy of 13 cows, containing only 2·86 per cent. of fat.

2nd. When a sample of milk is obtained from a can or pail in the ordinary course of sale by retail, the successive portions as ordinarily drawn, will contain a gradually diminishing proportion of fat, unless great care is taken to thoroughly rouse the milk in the can each time. From the results of the analyses of the first, middle, and last portions, of milk as obtained from the cows, as well as from the analyses of samples drawn from the top, middle, and bottom, of cans or churns of milk, *the tendency of cream to rise to the top or surface has been in all cases clearly established.*

We have largely experimented in this direction, both upon milk as obtained from the cows and on churns of milk as they arrive at the railway stations in London, and the result of our experience is, that where a sample of milk is obtained from the middle or towards the bottom of a can, serious injustice might be inflicted upon the owner if the proportion of 2·8 per cent. of fat was considered conclusive evidence of the abstraction of cream.

Finally, the specific charge in the present case is the abstraction of cream, but as the "solids not fat" appear low in our analysis, it is proper to point out that after making the necessary allowance for the decomposition that has taken place, we find that the quantity of 'solids not fat' in the sample, is not lower than has been obtained by others as well as by ourselves in numerous samples of genuine milk.

As witness our hands this twenty-eighth day of March, one thousand eight hundred and seventy-six.

J. Bell, R. Bannister, G. Lewin."

Note.—The *italics* are my own, A.H.

It will be observed that there is no very great discrepancy between the analytical results obtained at Somerset House and by myself, the principal difference between us is as to the interpretation to be put upon them.

The milk having been referred to Somerset House, I requested Mr. E. W. T. Jones, to analyse the remainder of the portion submitted to me. The following is a copy of his report.

31*st March*, 1876.

Report on sample of milk marked "No. 3, A. H.," handed to me by Dr. Hill yesterday.

1. I have made two estimations of the Solids and Fat, the figures as under in each case supporting one another.

	1st Experiment.	2nd Experiment.	Mean.
Total Solids ...	11·01	10·93	10·97 per cent.
Fat	2·67	2·55	2·56 ,,
Solids not Fat ...	8·44	8·38	8·41 ,,

2. I have carefully determined the acidity of the sample, and by experiment proved that the Lactic Acid or the decomposition suffered by the milk does not detract from the practical accuracy of the above determinations.

On the above results I have to remark, that I consider the sample has been watered to the extent of about one tenth, this conclusion being based upon the paucity of the "solids not fat" which in genuine milk never fall below 9 per cent., and in mixed milk from a number of cows are invariably 9·3 to 9·4 per cent., indeed within a shade they amount to this in ninety-nine cases out of the hundred in milk from single cows. I must also mention that the fat in this sample is low and favours the opinion that a portion of the cream has been removed.

E. W. T. Jones, F.C.S.

This Report fairly confirms my results, which however, are actually a little above Mr. Jones' as regards solids not fat, and total solids, and his opinion also is in accordance with mine, that the milk has been tampered with. At the first adjourned hearing of the case before the magistrates, two witnesses were put forward by the defence, viz.: Dr. Anderson, a medical practitioner of Coventry, and Mr. Bird, a druggist, of Birmingham. The first named witness said he had taken the specific gravity of the milk, and measured the quantity of cream, and therefore stated that the milk was of good quality, perfectly genuine, and such as he should not object to order for his patients, or use himself. In reply to the bench he admitted he had not made a full scientific chemical analysis. As a proof of the value of Dr. Anderson's chemical opinion, I may state, that he informed me that he did not believe in the Ether process of analysing milk. Mr. Bird, was however, to produce both the chemical results and the opinions intended to refute my own; the opinions came first, they are more easily got at than results, and are not so tangible or capable of refutation. He had examined the milk, and he found it to be perfectly genuine; he totally disagreed with me, he did not, however, put forward his note book, or even his analytical results, but he produced a letter book, containing a copy of his report on the milk. These are the figures: —

Fat	2·6
Casein and milk sugar	6·9
Total	9·5

And upon these results he unhesitatingly pronounced the opinion that this milk from a large herd of cows on a Warwickshire farm was perfectly genuine. Comment is unnecessary.

From a report of the case in the "Coventry Times," I subsequently learnt that portions of the milk had been forwarded to Dr. Redwood, and Dr. Voelcker, as shown by the following extract: "His client," (Mr. Wilks) "had gone to the highest authorities possible, viz.: Professor Voelcker and Professor Redwood, and if the case had gone on he would have called Professor Redwood and Professor Voelcker into the witness box; but what would have been their testimony, was determined by the reports which they had given. Professor Voelcker had analysed portions of the milk—of this very milk—and he had said, "It is a genuine milk in my judgment, and, as you will notice, somewhat richer in fat than the sample handed me by Professor Redwood," and added, "It is too bad to condemn such a sample of milk as the one sent me by Mr. Alfred Bird." Professor Voelcker's analysis of this milk was as follows:—

Water	88·992
Fat	3·144
Milk Sugar, Casein, &c.	7·114
Mineral matter, Ash	·700
Total	99·950

The results obtained by Dr. Redwood are not given, though Dr. Voelcker says in his report, that the portion examined by him was somewhat richer in fat than the sample handed to him by Dr. Redwood. Let us see how the results of analysis of this much-analysed sample of milk came out under the hands of the different operators.

	Solids not Fat.	Fat.	Total Solids.	Ash.
Dr. Hill	8·67	2·47	11·14	·72
Inland Revenue Chemists ...	8·21	2·83	11.04	·62
Mr. E. W. T. Jones ...	8·41	2·56	10·97	
Dr. Voelcker	7·814	3·114	10·958	·700
Mr. Bird	6·9	2·6	9·5	exclusive of Ash.

There is not that degree of accordance which one could have desired to see, except in the first three series of results. These are, perhaps, as near, under the circumstances, as could be expected, but it will be seen that in every case the figures are below the standard proposed by this Society, and as far as my experience goes, below those yielded by the milk of any healthy, properly, or even improperly, fed dairy of cows.

During the last year, I have for my own guidance, had several herds of cows milked out in the presence of either my assistant, my son, or myself, and I have satisfaction in submitting the analyses of these samples to your notice. *(See next page.)*

The results in No. 1 Series having been obtained under an antiquated method of analysis, I give only the solids and the ash. Nos. 2, 3, and 4, Series, I found to be individually, as well as on the average, remarkably good milks, and having found them so, I inquired for a dairy in the town, where the animals were constantly kept "up," and where the food was poor, consisting very largely of grains. The milks in No. 5 Series, were obtained from such a dairy, where the avowed object, as expressed to me by the dairyman, was to feed the cows on a cheap food,

	DESCRIPTION.	SOLIDS NOT FAT.	FAT.	TOTAL SOLIDS.	ASH.
1872. June 10. No. 1 Series.	Average of 6 milks from as many Cows, on a farm a few miles from Birmingham. At grass. Milked in my presence			12·93	0·77
1875. July 23. No. 2 Series.	From a farm at Harborne, milked in the presence of my Assistant... ...	9·92	3·01	12·93	0·72
		9·68	2·96	12·64	0·74
		10·00	3·11	13·11	0·75
		10·41	3·64	14·05	0·83
		10·51	4·02	14·53	0·80
		9·11	3·06	12·17	0·76
	Average	9·94	3·30	13·24	·77
1876. March 30. No. 3 Series.	From a farm on the borders of the Borough. Six cows partly stall-fed on mangel, hay and a little grains. Occasionally grazed. Milked in my presence	9·29	3·52	12·81	0·88
		9·72	3·69	13·41	0·82
		9·94	3·51	13·45	0·78
		9·52	3·85	13·37	0·72
		9·73	3·48	13·21	0·61
		9·47	3·74	13·21	0·66
	Average	9·61	3·63	13·24	0·74
April 24. No. 4 Series.	Five stall-fed cows at West Bromwich. Food—hay, bean flour, and grains. Milked in presence of my son, Dr. Bostock Hill	10·41	3·30	13·71	0·70
		9·05	3·15	12·20	0·77
		9·91	3·04	12·95	0·70
		9·81	3·90	13·71	0·74
		9·04	2·74	11·76	0·73
	Average	9·64	3·23	12·86	0·73
April . No. 5 Series.	Dairy of 7 cows in the Borough, never turned out, fed largely on grains with a view to yield a large quantity of milk, regardless of quality. Milked in my presence	8·80	2·38	11·18	0·68
		9·20	2·16	11·36	0·70
		10·40	3·40	13·87	0·62
		9·65	2·95	12·60	0·76
		10·66	4·04	14·70	0·68
		9·88	2·88	12·76	0·74
		9·60	2·71	12·31	0·80
	Average	9·74	2·93	12·68	0·71
March 30. No. 6 Series.	Sent me by a farmer, and described as a bulk sample from 14 cows on a Warwickshire farm. Food—mangels ...	9·52	2·87	12·39	0·72
No. 7 Series.	Samples of milk purchased by the Inspector in Coventry at the same time as the adulterated sample, viz. :—March 1876	9·20	3·20	12·40	0·68
		9·56	3·60	13·16	0·66
		9·90	3·50	13·40	0·69
		10·15	2·88	13·30	0·66
	Average	9·70	3·29	13·06	0·67
No. 8 Series.	Samples of milk purchased by the Inspector in Alcester, Warwickshire, in September and October, 1874 ...	9·30	3·61	12·91	0·74
		10·09	3·52	13·61	0·79
		10·77	2·94	13·71	0·79
		9·97	3·45	13·42	0·72
	Average	10·03	3·38	13·41	0·76
	Good country milk (Wanklyn)... ...	9·28	3·07	12·45	0·71
	Chevallier and Henri	10·16	2·99	13·15	0·68
	Poggiale (average 10 cows)	...	4·38	13·70	0·55
	Boussingault	...	3·90	...	0·85
	Vernois and Becquerel	...	3·61	...	

which would induce a large yield of milk, without any regard to its richness. An inspection of this table shews that only two out of the seven cows, in spite of the artificial feeding, gave a poor milk; these are the first and second, the cream in both cases is low, but in only one are the solids not fat, much lower than usual, while in one or two others where the cream is a little low, the solids not fat are decidedly high, and the result is an average yield, only a little low in cream, but high in solids not fat and in total solids. Now this result being in spite of poor and artificial feeding, I contend that 9·3 per cent. of solids not fat, forms a sufficiently low standard for the guidance of Analysts in forming an opinion of adulteration, and that the still lower standard recommended by this Society of 9 per cent. solids not fat, and 2·5 per cent. fat, is fair and extremely liberal to the milk dealer, and besides meeting every proper case, is also low enough to admit of a very considerable amount of adulteration in rich milks such as are presented in the first four Series.

Assuming the possibility of the fat being so low as that given in the Somerset House Report, owing either to the quantity being naturally low, or owing to the cream having risen out of the lower strata of milk in the can, there is still the difficulty of accounting for the small quantity of "solids not fat," which, unfortunately for the milkman, but fortunately for analysts and consumers, do not rise like cream. This fact, however, is faced with admirable courage, and we are told that as the "solids not fat," appear low . . . . it is proper to point out that after making the necessary allowance for the decomposition that has taken place, we find that the quantity of "solids not fat," in the sample, is not lower than has been obtained by others, as well as by ourselves in *numerous* samples of genuine milk."

We are not told what allowance was made for decomposition, but such decomposition must have been extremely small, I dissent entirely from the conclusion that a milk with such a small quantity of cream, *associated with so small a quantity of solids not fat*, can possibly be genuine. I am prepared to admit that with poor or improper feeding the cream may be as low or even lower in *individual* or *rare* instances, but the other solids of the milk will not be so low at the same time, and even if this were so as regards some half-starved, ill-fed or unhealthy single cow, it could not apply to a healthy animal, still less could it apply to a large herd of cows similarly favourably circumstanced. I am fully aware that some remarkably low results have been obtained by other chemists, *e.g.* 9·70, and even 9·30 per cent. of total solids by Dr. Voelcker, but the cows yielding these are admitted to have been in an actually starving condition, and such milk as this can hardly be considered normal or fit to be set up as a "milk standard."

Some low results are also quoted in the Chemical News, vol. xxxii. p. 28, by my friend, Dr. J. Campbell Brown, from the analyses of milks obtained under very unfavourable circumstances, the cows being "badly fed," "half starved," &c., No. 8, No. 9, No. 10, in Dr. Brown's letter, but I cannot think that these ought to be considered genuine milks, or even if they are, they would occur only exceptionally, and are unfit to be taken as standards of quality. Some other results shew the importance of relying not altogether on the quantity of fat alone, or on the quantity of "solids not fat" alone, because it is often seen that with low "solids not fat" there is a high proportion of fat

and *vice versa*, and in such cases as No. 4, No. 5, and No. 6, cited by Dr. Brown in the same letter, this is well exemplified.

With regard to the separation in the can to which so much importance is attached in the Somerset House report, I do not admit that the analyst has anything to do with that, because such a principle being conceded where is the line to be drawn? Not even it seems to me at the point when all the cream has so separated. This, however, is as complete a *reductio ad absurdum* as can well be conceived, but it is logically quite consistent and shews the difficulty of dealing with such cases. The analyst ought rather to assume that the milkman knows his business, and that before he deals out each portion of milk he will take the precaution (of the necessity for which he is well aware) to stir up the milk in the can. It was stated in defence in the Coventry case, that the milk is conveyed about the town in a large can or churn, suspended on a sort of hand cart, and that the contents of the can are drawn off by a tap fixed near the bottom. This may be an explanation of the small amount of cream in the milk, but it is not an excuse; in the first place it proves too much in accounting for a diminution of cream which had been previously denied; in the next, if this mode of conveying the milk leads to such a state of things, it is easy to substitute a better one. It is manifestly unfair to the purchaser to draw off a lower layer of milk deprived of its cream and to leave this upper layer of cream and milk till the last; possibly not to be sold at all but to be returned to the dairy. It would be as fair to take the first runnings, poor in cream, and sell them as genuine milk (which of course in a sense they would be) and retain the last portions rich in cream for making butter. The milk so sold would be genuine, but the proceeding would nevertheless be a fraud.

From the concluding statement of the Somerset House report, it appears that the Analysts there, consider that neither the small quantity of cream nor the low amount of "solids not fat" are inconsistent with the milk being genuine. Now if this be so, there is no possibility of a standard being set up higher than the lowest quality of milk, ever obtained in any case from any animal under any unfavourable condition of health or feeding. Such a standard is very safe not to inflict any hardship on the dairyman, but analysts were not appointed for the sole purpose of protecting milkmen. They have duties towards the public generally, and I contend that to pass milks of the low quality considered by the Somerset House Analysts to be genuine, is not only opposed to the experience of Chemists in general, and to the very fair and in many cases too low standard of this Society; but it is opposed to truth and to the public interest. Referring to milk No. 4, in No. 7 Series, in order to reduce the solids not fat, to the quality yielded by the Coventry sample in the hands of the Somerset House Analysts it would be necessary to add nearly 23 parts of water to 100 parts of the milk, and to reduce No. 3 milk in No. 8 Series to the same point, it would require 31·5 parts of water to be added to 100 parts of the milk. However tender this might be towards the milk dealer, it would be very hard towards the purchaser and grossly unjust.

In conclusion, it is to be sincerely hoped that the discussion upon this important question may lead to its satisfactory settlement, and that in future there may be an absence of conflicting opinion as to the standard of pure milk between the Public Analysts of this country and the Inland Revenue Chemists.

ON AN ABNORMAL SAMPLE OF NEW MILK.

By John Pattinson, F.C.S., Public Analyst for Newcastle-upon-Tyne and South Shields

Read before the Society of Public Analysts, at Burlington House, May 3rd, 1876.

The composition of some samples of new milk I have recently examined, differs so much from that which usually prevails, that I deem it of importance to bring the results I have obtained before the members of this Society; more especially as there can be no doubt of the genuineness of the samples.

In December last, the owner of a dairy farm in the neighbourhood of South Shields, brought me a sample of milk for analysis, representing that the sample was just as given by a cow in his possession. I found the milk to contain :—

Solids not fat	6·68 per cent.
Fat	2·92 „
Total Solids	9·60 per cent.

To satisfy myself that milk of such poor quality could be given by a healthy cow, I arranged with the farmer to go and see the cow milked myself, and to obtain another sample. This was done on the 5th of January last. The cow was a roan-coloured Durham short-horn, which had calved, I understand in the March of last year. It and seven other cows, Durham short-horns, were stall-fed, not being allowed to go out excepting once a-day to obtain water. I was told that they were fed upon turnips three times a-day, a mixture of brewer's grains and one pint of peas meal, three times a-day, and as much hay as they chose to eat. The milk that I saw taken from the roan short-horn, I found to contain as follows, the analysis being made in duplicate :—

	1	2
Solids not Fat	7·04 per cent.	7·06 per cent.
Fat	3·22 „	3·25 „
Total Solids ...	10·26 „	10·31 „

Sp. gr. of New Milk	1023·4
Ditto Skimmed	1026·3
Percentage of Cream	11½

The milk was observed to have a peculiar saline taste, and in order to find out the cause of this, the amounts of ash and chlorine were determined. It was found to contain 0·94 per cent. of ash, and 0·27 per cent. of chlorine, equal to 0·45 per cent. of sodium chloride. This amount of chlorine is much larger than that which is usually found in milk, and it will be seen hereafter that it is much larger than is found in the milk of some, at any rate, of the cows in the same shed fed on exactly the same food. The same per centage (0·45) of common salt was added to distilled water, and the solution was found to have a saline taste of just about the same intensity as the milk. There can be no doubt, therefore, that the peculiar taste was owing to the presence of an alkaline chloride. On inquiry, I found that no salt, as such, was given to the cows with any of their food.

In order to ascertain if the roan cow was in a healthy state or otherwise, I went again to the farm, accompanied by a veterinary surgeon. After a careful examination he pronounced the cow to be perfectly healthy. She was about six years of age, and very fat. The farmer's opinion was that she was going dry, as she was now giving less

milk than previously. On this occasion, not only did I obtain a sample of this cow's milk, but also a sample from another cow, a white one, which was represented as giving very good milk. I also took an average sample of the milk of all the eight cows in the shed. I saw all the cows milked, and am quite certain that nothing was added to the samples that I obtained. The feeding in all cases was the same as before described. The milk of the roan cow had the same saline taste possessed by the last sample, but neither of the other samples had this peculiar taste. The roan cow gave seven pints, and the white one, nine and a-half pints of milk, all the cows were milked "dry." On analysis the following results were obtained:—

	Milk from Roan Cow.	Milk from White Cow.	Average Milk from Eight Cows.
Solids not Fat	6·94 per cent.	9·76 per cent.	9·14 per cent.
Fat	3·00 „	3·71 „	3·53 „
Total Solids ...	9.94 „	13·47 „	12·67 „
Sp. gr. of New Milk ...	1023·1	1032·0	1031·0
Ditto Skimmed	1025·2	1035·2	1034·2
Cream	15·0 per cent.	11·0 per cent.	9·3 per cent.

A more complete analysis was made of each of these samples, with the following results:—

	Milk frem Roan Cow.	Milk from White Cow.	Average Milk from Eight Cows.
Water (by difference) ...	90·15 per eent.	86·80 per cent.	87·54 per cent.
Fat...	3·00 „	3·71 „	3·53 „
Caseine	2·00 „	3·97 „	3·05 „
Milk Sugar	3·90 „	4·65 „	5·15 „
Ash	0·95 „	0·87 „	0·73 „
	100·00	100·00	100·00
Chlorine in Ash	0·27 per cent.	0·14 per cent.	0·13 per cent.
Equal to Sodium Chloride	0·44 „	0·23 „	0·21 „

The milk sugar was found by evaporating the dilute alcoholic solution, weighing the residue and deducting from it the portion of ash it contained. The solid matters of the complete analyses are somewhat less than the total solids found by evaporation, probably owing to the latter containing some combined water.

The amounts of chlorine are larger in all cases than other chemists have found, so far as I am aware. The highest amount of chlorine I have been able to find in published analyses, is in an analysis by Haidlen, which shows 0·107 per cent. of chlorine; but usually the amount of chlorine found is from 0·06 to 0·08 per cent. In the analyses I made, the chlorine was determined in the watery solution after evaporating the milk at 212° F., and extracting the fat by ether, not in the ash left after ignition, as is done by some analysts; for I find that a notable quantity of the chlorine is lost by volatilization during ignition. This may perhaps account for the higher amount of chlorine found in some of my analyses. Another way of accounting for the excess, is that the farm is situated near the sea, and the hay will therefore probably contain more salt than hay grown farther inland. Be this as it may, there still remains the remarkable fact that the poor milk of the roan cow contains about twice as much chlorine as either of the other samples, although all the cows were fed on precisely the same kind of food. I myself have never before had a sample of genuine new milk of poorer quality; and this is undoubtedly, the general experience.

The following discussion ensued on the two foregoing papers :—

Mr. Wanklyn pointed out that though a notion had lately sprung up in certain quarters that the "solids not fat" in milk did sometimes fall below 9·3 per cent., yet it was only in cases where the cows were diseased, or where the sample of so-called milk was really "strippings" that such a thing took place. Strippings differed from average milk inasmuch as they contained an excessive proportion of fat, and the application of the proper formula would immediately eliminate any error due to this fact by providing for the calculation of the ratio between "solids not fat" and water. The case of abstracted fat or cream presented more difficulties, and he thought a convention should take place on the subject.

Mr. Allen mentioned, that although Dr. Hill's results were obtained on the fresh milk, and the others on the samples which had been kept some weeks, yet it would be observed that the "total solids," found by Hill, Jones, and the Inland Revenue Chemists were practically identical. In the case of Mr. Jones, the analysis was made after that of the Inland Revenue Chemists, and as he repeated his determinations, and took special precautions to ensure accuracy, his results were valuable. As the "total solids" found by the Inland Revenue Chemists agreed so closely with the results obtained by Dr. Hill on the fresh milk, it was quite clear that very little decomposition had taken place. In this case the proportion of total solids found by two different chemists in the stale milk, clearly prove that change had only occurred to an insignificant extent, but the Inland Revenue Chemists differ from Messrs. Hill and Jones, in obtaining a larger proportion of fat, and it might appear to be possibly due to the fat being determined at Somerset House by subtracting the "solids not fat," from the "total solids." As two chemists of large experience in milk analysis, agreed in finding a maximum of 2·56 per cent. of fat, it is impossible to avoid the conclusion that the Inland Revenue Analysis was erroneous. Nevertheless, he thought Dr. Hill was rash in pronouncing the milk to be skimmed, as it is certain that genuine milk was to be met with containing as little as 2·5 per cent. of fat. The presumption was that it was skimmed, but he did not think the proof conclusive. On the other hand, he thought the milk might fairly have been condemned as adulterated with water. The speaker objected to the misuse of the word "standard." The Society of Public Analysts never prescribed a standard at all. They recommended that 9·00 of "solids not fat," and 2·5 per cent. of fat should be recognized as the "limits" of these constituents of milk, but in calculating the probable amount of dilution in a watered milk, average milk should be taken as the standard.

Mr. Rimmington said it was impossible for analysts to take cognizance of such exceptional samples of poor milk. He considered the standard generally acted upon, viz., 9·0 "solid not fat," a very fair one, and more favourable to the seller than the buyer. It is quite low enough, and admitted of 10 or 15 per cent. water being added to very good milk. It would be better to give up the analysis of milk altogether, if nothing better can be done for the public than the standard which Somerset House endeavours to set up. If once such a limit be assented to, nothing better would be supplied.

Mr. Jones said the figures given in his analysis were the mean of two closely concordant analyses, and he thought, on the fair assumption of their correctness, they proved conclusively that the milk was a watered one. He would meet the observations as to decomposition probably interfering with the analytical results, by stating in the first

place, that these analyses were the latest made of this milk, and that the lactic acid was neutralized by adding the requisite amount of sodic carbonate to form sodic lactate, which being insoluble in ether could not increase the figure for fat, or lessen the "solids not fat."

Dr. Dupré expressed his pleasure that Dr. Hill had again brought forward several of the points to which he (Dr. Dupré) drew the attention of the Society some months since. It could not be too emphatically stated that, since the milk supplied in towns is always derived from a *number* of cows, no results obtained with the milk of *single* cows should be admitted as furnishing a standard, or even a guide for comparison. Secondly, as the public have a right to insist that the milk they buy is taken from healthy cows, and which (to say the least) are not *actually starving*, all results obtained under such conditions as those of Dr. Voelcker should be absolutely rejected. Lastly, milk vendors are bound to supply all their customers with milk of fairly uniform quality; no excuse for a deficiency of cream, based on the well-known fact that cream has a tendency to rise to the surface, should be for a moment allowed. The milk vendor can, with very little trouble, prevent the cream from separating, by simply emptying the measure with which he takes out the milk, several times back into the can before supplying his customers.

Dr. Muter pointed out that analysts had themselves contributed to the confusion on this subject, by ingenious defences, the only merit of which was their ingenuity. His own experience was, that the milkmen in his district systematically brought the milk down to his standard. He wished that Dr. Hill had examined the ash so as to detect carbonate of soda or borax if they were present.

Dr. Redwood said the sample of milk analysed by him, was sent by Mr. Wilks, of Coventry, together with a sample to be forwarded to Dr. Voelcker. He was told, the only question at issue was, whether cream had been abstracted. The result of his analysis did not, in his opinion, justify the conclusion that cream had been abstracted, and he reported to that effect. He did not recollect the real quantity of fat he obtained, but believed it was about 2·4 per cent. and genuine milk from healthy cows, even the entire milk from a herd of cows, would sometimes, yield as small a proportion of fat as that. Fat was the most variable constituent of milk, and it was very quickly affected by the quality of the food of the animals. His experience had not afforded him such uniform results as those described by Dr. Hill. With reference to the case at Coventry, he agreed with a remark which had been made by a previous speaker, that judging from the analysis of Dr. Hill, there was more evidence of its having been watered than skimmed.

In reply, Dr. Hill stated that his invariable custom was to determine by actual weighing, both the "solids not fat" and the fat, and that he checked the combined weight of these two determinations by the weighing of a separate portion of milk evaporated to dryness. Dr. Hill further said that the result of the analysis would have justified either the conclusion that cream had been abstracted or water added, and he thought it highly probable that both forms of sophistication had been resorted to. He was, however, influenced in the case in question to report abstraction of cream, by the consideration that, comparing the sample in question with the other samples of milk purchased by the Inspector in Coventry at the same time, he found a greater proportionate difference between the quantities of fat than between those of "solids not fat."

ON THE DETERMINATION OF THE MELTING-POINTS OF BUTTER AND OTHER FATS.

By T. Redwood, Ph.D.

Read before the Society of Public Analysts, at Burlington House, May 3rd, 1876.

In a discussion which followed the reading of papers by Dr. Tripe, Mr. Angell, and Mr. Heisch, in May of last year, on methods for determining the fusing points of fats, I alluded to a method which I have long adopted for effecting that object. The purport of what I said is briefly reported in the "proceedings" of this society, at page 137, but the description of the process, which I gave in general terms, omits some points of detail which I wish now to add. I have found the process a very convenient one, which appears to afford accurate results, and to be well suited for the determination of the melting points of fats, especially where several have to be operated upon.

The apparatus in the form best suited for general use, consists of a basin, two small beakers and a thermometer. I use an enamelled iron basin, about six inches in diameter and three and a-half inches deep. In this I place a beaker four and a-half inches deep and three inches in diameter, and within this beaker is placed another much smaller one, supported by its projecting rim on a disc of tin-plate or copper, the outer edge of which rests on the mouth of the larger beaker. Some mercury is put into the smaller beaker to a depth of about an inch, and cold water into the larger beaker so that its surface shall be half an inch or an inch higher than that of the mercury. A small drop of the fat, which has been previously melted and heated to several degrees above its melting point, but has been allowed to cool again to near its setting point, is put on to the surface of the cold mercury. This is best done by means of a thin glass rod, about one-eighth of an inch in diameter, the end of which has been rounded off in the blow-pipe flame. It is important that the drop should be very small, and its temperature when placed on the mercury not much above its melting point, for if it be too hot it will spread over the surface of the mercury, which is not desirable. If the rounded end of the rod be slightly dipped into the melted fat and then brought to the surface of the mercury, a small hemispherical particle will attach itself there and speedily congeal, becoming more or less opaque in doing so. The weight of one of these hemispherical masses, which should not be more than the eighth of an inch in diameter, will be from $\frac{1}{50}$ to $\frac{1}{10}$ of a grain. Having placed the drop of fat on to the mercury, the bulb of a thermometer with sufficiently minute graduations is introduced into the mercury, and hot water poured into the basin. The heat is thus communicated to the contents of the small beaker slowly through the water in the larger beaker, and the rise of temperature in the mercury may be easily regulated and should take place at the rate of about one degree per minute. The mercury by virtue of its comparatively good conducting power, acquires a uniform temperature throughout, which is indicated by the thermometer and at the same time communicated to the fat. The fat, when the temperature approaches its melting point, becomes partially transparent, and if the stem or elongated bulb of the thermometer be now brought up against it, the moment fusion takes place the liquid fat will run into the channel formed by the repulsion of the mercury and the outside of the thermometer tube.* This process presents the following advantages:—

* Two samples of what I believe to have been genuine fresh butter, tested by this process, after having been purified by solution in ether, gave respectively 80·5° and 81·5° F. as their lowest, and 83·5° and 84·5° as their highest melting points.

1. The heat-conducting power of the mercury, on which the fat is placed, ensures the equalisation of the temperature as indicated by the thermometer and at the same time communicated to the fat.

2. The direct contact of the fat with the mercury, without the intervention of a bad conducting medium, such as glass, ensures a more immediate and correct indication of the temperature at which liquefaction takes place than would otherwise occur.

3. The minuteness of the quantity of fat operated upon reduces to a minimum the time occupied in its melting, and thus facilitates the determination with exactness of its melting point.

4. The time occupied in preparing small tubes and charging them with the fat is saved, and several experiments in succession may be easily and rapidly made with the same apparatus.

In the discussion which followed Dr. Dupré enquired whether the author had made any accurate experiments on the influence of previous fusion on the melting point of butter fat, or as to the time which should be allowed to pass between the fusion of the fat and the taking of the melting point, as he, Dr. Dupré, had found the melting point vary as much as 10° F., and even more from the correct point, when taken immediately after a previous fusion.

Mr. Wigner pointed out that the old plan of coating the bulb of the thermometer with the fat to be tested, and slowly heating in a water bath seemed to give results as accurate as any other process. He then made a few remarks on the relation between the temperature at which the specific gravity bubbles rise in melted fats, and the actual densities of the fats.

In reply, Dr. Redwood said, he did not attach much importance to the melting-point of butter as a characteristic by which to judge of its genuineness or otherwise, but he adopted what he found to be the most convenient and accurate method of making the determination. He did not find that there was any marked difference in the results obtained by his process as compared with those obtained by melting the fat in thin capillary tubes, but there was a material difference as compared with the sinking of glass bulbs by Mr. Angell's method. What he had observed and found it important to pay particular attention to was, that in butter, as well as other fats, such as tallows, there were at least two melting points dependent upon, the way in which the fat had been previously subjected to the action of heat, and they may differ in butter, to the extent of 3 or 4° F., the lower melting point being that of the fat after it has been heated, to several degrees above its first melting point, and the higher melting point being that of fat which has been previously melted at the lowest possible temperature, and then immediately allowed to congeal

ON THE DETECTION OF NITROUS ACID IN NATURAL WATERS AND OTHER DILUTE SOLUTIONS.

By R. Fresenius.

(Zeitschr. f. Anal. Chem. XV. 230-232.)

In a previous number (vol. 12, p. 427) the author recommended the following as the most sensitive and reliable method for detecting nitrous acid in natural waters. The water, after acidification with pure acetic acid, is distilled and the distillate received into potassic iodide, and starch solution, acidified with sulphuric acid.

To this method Kämmerer raised the following objections:—

1. That nitrates upon warming in presence of organic substances are reduced to nitrites; and

2. That the nitrous acid after liberation might upon warming be reduced by organic matter to nitrous oxide, nitrogen, or ammonia.

In the present paper Dr. Fresenius quotes the results of Plugge and Gratama to disprove the first objection raised by Kämmerer, and gives a series of experiments showing the second objection to be wrong.

Still maintaining, therefore, the accuracy of his own method, Dr. Fresenius gives a caution against its use for waters where bacteria in the presence of hydrocarbons may have reduced nitrates; and in such as contain abnormal substances, which would destroy the nitrous acid when formed *e.g.* sulphuretted hydrogen.

F. J. L.

ON THE SEPARATION OF MORPHIA AND SUGAR.

The Pharmaziesche Zeitung, Berlin, of the 28th March, contains a paper by Dr. Schacht on the separation of morphia and sugar, a subject of some interest to analysts in this country, when we remember the frequent occurrence of morphia poisoning by sweetened soothing syrups, and other patent medicines containing this Alkaloid. Dr. Schacht having found the estimation of morphia in powders containing sugar, to be by no means satisfactory, made the following experiment: 0·075 grs. of muriate of morphia was mixed with 0·5 grams of sugar, and the mixture treated with commercial absolute alcohol, to which a trace of hydrochloric acid had been added. On the addition of ammonia to the resulting yellow solution, no precipitate was obtained. In the second experiment, the mixture was treated in the cold, without the addition of acid; the alcoholic solution evaporated in the water bath, and the residue dissolved in acidulated water; on treating this solution with ammonia and amylic alcohol, it yielded a residue which was coloured red by sulphuric acid, and consisted of a compound of sugar and morphia. The author was not more successful when he treated the substance in the cold with amylic alcohol, and the results yielded by chloroform were still more unsatisfactory. Acid carbonate of potash, precipitated the greater part of the morphia from the aqueous solution, but not enough for quantitative purposes. From these results the author concludes that the separation of morphia and sugar is as yet impossible. Dr. Schacht promises to communicate his further investigations on this subject.

H. de A. P.

VOLUMETRIC ESTIMATION OF SULPHURIC ACID.

Mr. Edward Hart, in the *American Chemist*, for February, 1876, in pointing out certain difficulties in the volumetric estimation of sulphuric acid, suggests the following process. A straight tube of glass is drawn out to a fine point at one end, and into the other end some fine asbestos is introduced, and tightly pressed down towards the contracted end. The tube is then drawn out just behind the asbestos. When the small end is placed in a turbid fluid, and suction applied at the wide end, the liquid, perfectly cleared, ascends into the tube. When the action is reversed and the clear liquid is forced through the small end, a few drops appear turbid, but the bulk of the liquid remains clear and fit for testing. A few drops of the liquid are forced into a very small and carefully cleaned test tube, and a drop of standard solution of barium chloride from the burette added. Should a precipitate be formed, the test tube and filtering pipette are rinsed into the bulk of the solution, and more barium chloride added. On the proper point being reached, a precipitate is formed in the clear liquid by both barium and sulphuric acid solution. The solution, after each addition of barium chloride, is heated nearly to boiling. Mr. Hart states that where great exactness is not requisite this process is valuable. The average of four determinations of sulphuric acid in cupric sulphate, gave 31·92 per cent., the theoretical quantity being 32·08.—C. A C.

LOAN COLLECTION OF SCIENTIFIC APPARATUS SOUTH KENSINGTON MUSEUM.

This exhibition of apparatus is of special interest to all scientific men. On the whole it has been very judiciously collected and arranged. The advertising element so common to similar exhibitions has been greatly reduced, though of course not entirely eliminated, but it is in only one or two exhibits that any obtrusive appearance of this kind presents itself.

Pneumatic apparatus is well represented by every form of instrument used from the earliest air pump to the most improved "Sprengel," and from the Bunsen eudiometer to the McLeod apparatus.

The show of balances is meagre, several of the newer makers who have brought out specialities, especially those of the short beam type, being unrepresented. Telegraphic apparatus also makes a very poor show.

The "Gramme" magneto-electric machine, of course works well and attracts attention.

The biological apparatus is especially good, and well arranged, and there is also a very fine collection of acoustic apparatus embracing several novelties.

We may also notice with special commendation the exhibits by "The Pedagogic Museum" of Russia, which certainly appear to us superior for educational purposes to any similar collection we have seen elsewhere.

The conference on various subjects which have been held almost daily in one of the rooms have as a rule been interesting, and well attended. At the first chemical one the review by the President, Dr. Frankland, of ancient and modern eudiometric apparatus l to with much interest, as were also papers by Dr. Gilbert and others. We re have not space to produce these and other papers *in extenso*.

PROSECUTIONS UNDER THE "SALE OF FOOD AND DRUGS ACT."

At the Greenwich Police Court, Mr. William Newnham, grocer and cheesemonger, of Lewisham Road, Greenwich, appeared to an adjourned summons, taken out at the instance of the Greenwich District Board of Works, charging him with selling an article of food—to wit, butter—which was adulterated. Mr. Spencer attended to prosecute, and Mr. Robinson appeared for the defence. The case had been previously before the court, when Mr. Wigner's certificate showing that the sample of butter analysed by him as being bought at the defendant's shop, at 1s. 2d. per pound, contained more than 50 per cent of foreign fat, supposed to be of vegetable origin, was produced. Upon this an adjournment of the case was asked for, it being agreed that a second portion of the sample should undergo analysis at Somerset House. A certificate was now produced from that department, signed by Mr. Bell, Mr. Bannister, and Mr. Lewin, to the effect that, from the specific gravity of the fat and amount of fixed fatty acids obtained from it, they were of opinion that the sample analysed had been adulterated with not less than 70 per cent. of fat other than butter fat. The details of this analysis were thus given:—Water 7·11, curds 2·32, salt 1·99, and fat 88·58. Mr. Robinson, on hearing this result, said that it was widely different from what was expected, and although he could not dispute the accuracy of Dr. Bell, he wished to call evidence in the case, and also to put questions to Mr. Wigner in respect to analysis in the tests for adulterated butter. Mr. Patteson said that the second certificate showed a greater amount of adulteration than the first certificate, and he did not see what object there was in calling other evidence. Mr. Spencer objected to any other evidence being taken to re-open the case unless Mr. Bell was afforded an opportunity of being present, as it would have the effect of prejudicing the character of a public officer. Mr. Robinson said it was at the wish of the defendant that Mr. Bell had attended; but he was not going to advise the defendant to bear the expense of another adjournment. Mr. Wigner was then examined, in continuation of the evidence taken at the first hearing, and said, in answer to questions, that he found the sample to contain 89·25 per cent. of fat, and that the analysis of this fat showed fatty acids 91·85 per cent. A microscopical examination showed that the butter had been melted, and a further microscopical examination of the curd showed that it (the curd) consisted mainly of vegetable tissue. It was quite possible for the defendant to have inferred from the appearance, taste, and smell, of the butter sold, that it was adulterated. It had turned rancid when he commenced an examination of it on the afternoon of the day he received the sample—the day the butter was purchased—or the next morning. He denied that fresh butter of the highest class was more likely to turn rancid than other butter. For the defence, Mr. Robinson called an analyst and two agents to importers of butter from the northern parts of Europe, the latter of whom said that the butter so imported underwent a certain process in this country by the adding of new milk, &c., and was so much in repute that it had risen in price 3d. and 4d. per pound within the past four or five months. It was a butter, they said, which was sold to the poorer classes, and would keep longer from getting rancid than even fresh-made butter. The defendant was also examined, and stated that he bought the butter of a good firm in the Borough, and had sold it as butter. He said he could not tell from its appearance that it was adulterated, its appearance being equal to Dorset butter, but not its flavour. Mr. Patteson said there was no doubt the adulteration had been proved, and he believed the defendant had sold it as he bought it. He must impose a penalty, and he fined the defendant £2 and £1 costs.

Working of the Sale of Food and Drugs Act.—Henry White, dairyman, 1, Bowling Green Row, Woolwich, was summoned for refusing to sell Mr. John Carty, the inspector appointed under the Act, a sample of milk for the purpose of analysis. Mr. Carty said he called at defendant's shop and asked to be served with a pint of milk, offering 3d. in coppers and a jug. Defendant said he had no milk; but witness noticed a can on the counter half full with milk, with measures hanging to the side of it. He told the defendant that he was liable to be fined £10, whereupon White said, "I don't care; I shall not serve you."—Defendant said he told the inspector that the milk in the can was ordered by customers.—Carty denied this, and Mr. Balguy fined the defendant 10s. and costs.

Adulterated Butter.—Thomas Schofield, grocer, 1, Mary Ann Street, North Woolwich, was summoned for selling adulterated buttter.—Mr. Carty, the officer appointed under the Sale of Food and Drugs Act, said that he purchased half-a-pound of butter at the defendant's shop, telling the wife, who served him, that it was for analysis. He sealed it up in a bottle in the presence of the defendant and his wife, and sent it to Mr. Wigner. He produced his certificate, showing that the butter contained more than 50 per cent. of fat. Defendant said that he bought the butter of a Mr. Price, believing it was genuine. He was a poor man, and hoped the magistrate would be lenient. Mr. Patteson told defendant that he ought to have procured a written warranty that the butter was genuine, and he could then have proceeded against the wholesale dealer. Of the half-pound of butter, costing 8d., there was less than four-pennyworth of butter. He let him off with a fine of 10s., and costs.

At the Leeds Police Court, John Derrick, shopkeeper, Mill Street, was summoned for selling new milk which was not of the quality demanded. The milk had been purchased by one of the assistant inspectors, who informed the defendant that it would be analysed. The defendant then said he hoped they would not analyse it this time, as he had mixed it with some old milk, and had taken the cream off. The borough analyst found that the milk contained 29 per cent. of water. The defendant now said he did not put anything in the milk. It must have been put in it before he got it. He only made 9d. a day out of the job. Mr. Bruce said his attention had been called to a decision of the London police magistrates, that the person taking proceedings must do so without prejudice. He would consider the case, and would adjourn it for ten days.

Some charges of adulteration have been heard at Westminster Police Court with peculiar results. A milkman was summoned before Mr. Arnold for selling an article of food that was not of the nature, substance and quality demanded by the purchaser. The sanitary inspector of St. Luke's Parish, Chelsea, had bought at the defendant's shop a quart of milk, which was found to contain 26 per cent. of water—a proportion which, we are almost superfluously told, "would render it unfit for the food of children and invalids." The addition of water was not disputed, and, after an argument on an extremely nice point, to which we shall presently allude, the magistrate, pronouncing the case a very bad one, fined the man £10 and 44s. costs. Not having the money to pay, or even goods on which to distrain, the milkman was sent to prison for three months, and, as this was apparently the second conviction in less than two years, his fate will not excite much pity. Another case of minor gravity was also decided against the accused, the offence being the old one of selling chicory in coffee without apprising the purchaser of the fact. The defendant pleaded inadvertence; but as there was no less than 40 per cent. of chicory, he was mulcted in the sum of 50s. and 23s. costs. The peculiarity of these cases is that, notwithstanding the severity of the inflictions, the magistrate came near absolving the guilty tradesmen altogether. The counsel for the milkman advanced the ingenious plea that, as the milk had not been sold as an article of food for consumption, but merely for the purpose of analysis, there could not have been any "prejudice to the purchaser;" and Mr. Arnold was "inclined to think the argument good and substantial." Ultimately, in giving his decision, he said that it was with much reluctance he felt himself obliged to follow the reported cases and the judgments of other magistrates, and to pronounce against the accused, as otherwise the Act would be useless. Now when one of the ablest and most experienced magistrates on the bench regrets that he has no alternative but to decide as his learned brethren had done before him, it is reasonable to suspect the Act has been badly drawn up, and if it has been it is not worse than many others which the most learned Judges profess themselves puzzled to construe. But in the present instance Mr. Arnold was surely over-fastidious, and the plea which so impressed him was only a dexterous quibble. The purchaser of the milk, the sanitary inspector of the parish, if not personally prejudiced, was the representative of other consumers who had been or would be so, and who could only reach the offender through their local authority. To make good his case of "no prejudice," the milkman's counsel would have to prove that milk so adulterated had not been sold to any consumer at any time, and that what the sanitary inspector got was a sample specially adulterated for his benefit—which is absurb. The purpose of the Act was not to define the object of the buyer, but to show the motive of the seller, and this is sufficiently secured when the latter vends over his counter an article sold in the usual way to a person of whom he knows nothing, except that he gives a price for a commodity supposed to be genuine. If there were any doubt on the point, the simplest plan would be to bring in an amending Bill, striking out entirely the words "prejudice to the consumer," and allowing no more to stand than the fact of sale in market overt.

The following appeal case will be read with interest as laying down, we believe for the first time, a distinct point at which Gin ceases to be Gin and become Gin and water. If this judgment be upheld we may expect to see numerous prosecutions for adulterating spirits by "letting down" with water:—

(Before Baron Cleasby and Mr. Justice Grove.)

FASHLER v. STEVENILT.

This was an appeal from a conviction under the 6th section of the Sale of Food and Drugs Act of last year. The question was, whether when a man asks for gin it is an offence to sell gin which is scientifically described as gin of low alcoholic strength, but which some people might call gin and water.

Mr. Graham (with whom was Mr. Wills, Q.C.) argued for the appellant; the respondent did not appear.

The appellent was a publican at Sleaford in Lincolnshire. The respondent, an inspector of police bought at the appellant's house a bottle of gin for which he paid 2s. 6d. Having previously given the appellant notice of his intention to do so, he had it analyzed. He then layed an information before the Justices, and charged the appellant with an offence under the 6th section of the Sale of Food and Drugs Act of last year. That section enacts that no person shall sell to the prejudice of the purchaser any article of food which is not of the nature, substance, and quality of the article demanded by such purchaser. The analyst proved that the gin in question contained 4 parts of sugar, 26 parts of alcohol, and 70 parts of water. He stated that it was gin of a low alcoholic strength. It was proved that there is no recognized standard of alcoholic strength for gin, but that it varies from proof to 20 degrees below. The gin in question was 44 degrees below proof. It was not proved that the appellant knew of the strength or weakness of the gin. The Justices fined him 1d., with costs. It was contended that there was no evidence upon which the Justices ought to have convicted.

Baron Cleasby thought the conviction was right. When the respondent asked for gin, he meant such gin as is ordinarily sold, and to sell him such gin as that in question was to sell, to the prejudice of the purchaser, gin which was not of the quality demanded. The amount of water proved to have been discovered with the gin afforded evidence that it had been added for the purpose of fraudulently increasing its measure.

Mr. Justice Grove concurred. He thought that when it was proved that the gin contained so much more water than gin ordinarily sold, the onus was thrown on the seller of proving that he did not know of the state in which it was.

THE BIRMINGHAM ADULTERATION CASE.

IMPORTANT DECISION.

On the 29th inst. at the Birmingham police Court, decision was given in the case of Richard Hughes, drysalter, Prospect Row, who was summoned for infringing the Adulteration Act, by selling, on the 19th of February, as pure, two ounces of milk of sulphur which was adulterated. The magistrates present were Mr. T. C. S. Kynnersley (stipendiary), Dr. Heslop, and Messrs. Ellis and Goodrick. Mr. Jesse Herbert (instructed by the town Clerk) appeared in support of the summons, and Mr. Tanner (Rowlands & Bagnall) represented the defendant.

Mr. Kynnersley said he should like to ask, in the first instance, whether druggists would consent in future to use a distinctive label stipulating that the article they retailed as milk of sulphur contained sulphate of lime?

Mr. Tanner having consulted with his client, said, although Mr. Hughes would be perfectly willing, individually, to do this, still the case was looked upon as a representative one, and there were a number of persons who felt strongly on the subject, and would most likely object to concede to such a proposal. He thought it would be better, therefore, if the Magistrates gave their decision upon the facts as proved.

Mr. Kynnersley accordingly gave decision as follows:—On Monday, the 22nd of May, the defendant Richard Hughes appeared before Dr. Heslop and myself on a summons obtained by Robert Woolley, inspector of nuisances for the borough, under the 38th and 39th Vic., c. 63, sec. 6, which enacts "that no person shall sell to the prejudice of the purchaser any article of food or any drug which is not of the nature, substance, and quality of the article demanded by such purchaser," under a penalty not exceeding £20; and it was proved that on the 19th of February George Leaton, acting under the instructions of Mr. Woolley, went to the shop of the defendant, who is a drysalter and grocer in the borough, and asked for two ounces of milk of sulphur, and received from him as such milk of sulphur two ounces of a powder which was subsequently analysed by Dr. Alfred Hill, borough analyst, and found to contain according to the certificate which was produced to us, 67 per cent. of sulphate of lime and 33 per cent. of pure sulphur. The certificate also stated that the article was a fraud, and injurious to health. Dr. Hill also, on examination, gave it as his opinion that it was so injurious because the effect of sulphate of lime, like all lime salts, would be to constipate the bowels, and to promote the formation of calculi, if there was any tendency in the constitution to such secretions. I may mention here that this opinion was controverted by Dr. Anthony, a witness called by the defendant, who stated that in his judgment sulphate of lime was not only not injurious to health, but that the sulphur was made more laxative by its addition. But I confess his evidence did not carry conviction to my mind. Dr. Heslop did not agree with him; and certainly I never heard that children's confectionery was improved by sulphate of lime being largely used in its composition. Now, it was not contended on the part of the prosecution that the presence of so much lime was an adulteration in the sense of a deliberate addition to the sulphur, nor is the term adulteration used at all in the present statute, and when Dr. Hill speaks of it as a fraud he means, I am sure, a legal not a moral fraud; but it was contended that the article complained of was prepared according to the formation of an old-fashioned, obsolete, and exploded pharmacopœia of 1746, which necessarily involved the presence of sulphate of lime; whereas if it had been prepared as it ought to have been, in accordance with all the more recent pharmacopœias, it would have been wholly free from lime, which Dr. Hill and others consider an unnecessary and a noxious ingredient, and, therefore, that the article sold was not of the "nature, substance, and quality demanded by the purchaser," and that the sale of it was "to his prejudice." The fact as I understand it, is this:—In order to produce milk of sulphur (*lac sulphuris*) or sulphur precipitatum (for it is contended by the prosecution, and, as I think, I shall show, justly contended, that the two are synonymous and convertible terms) it is necessary that the sulphur and lime should be boiled or heated together in water, and treated with the addition of an acid. Under the Pharmacopœia of 1746, the acid employed was sulphuric acid, and this involved the formation of a substance called sulphate of lime, which only requires drying or heating to become the well known plaster of Paris. This is mixed with the sulphur, and is the identical article sold by the defendant, except that the proportion of lime appears to be much larger than in any of the other cases that have been made the subjects of prosecution under the section. In all the recent pharmacopœias the acid employed is hydrochloric or muriatic acid, and in this preparation the lime wholly disappears, and the produce is the pure sulphur precipitatum, which contains no lime at all. I may not be technically exact in this description, but that is what I understand to be the case. The value of the latter is exactly double that of the former; and the question is whether a person who sells under the same name with the pure article a mixture of which only one-third is pure sulphur and two-thirds plaster of Paris, does not come under the provisions of this statute as selling a drug which is not of the nature, substance, and quality of the article demanded. Now, the defendant contends, and calls several most respectable chemists—gentlemen of the highest possible character—to support him, that milk of sulphur (lac sulphuris) and sulphur precipitatum are totally different things, that lac sulphuris is not sulphur precipitatum, and sulphur precipitatum is not lac sulphuris; that the substance containing lime is properly called lac sulphuris, and the substance which does not contain it is properly called sulphur precipitatum, and that this is a distinction well known and acted upon by all druggists, grocers, and drysalters, and therefore he does no wrong in selling the impure article under the name of milk of sulphur, which he contends is the article demanded under that name. But I am convinced that this is a position which cannot be maintained. The evidence in this case is entirely against it. On the same day on which the article in question was purchased from the defendant as milk of sulphur, twelve other purchases were made of milk of sulphur from other tradesmen. In ten of them the article was found to be pure sulphur precipitatum without a particle of lime, and in only two others was any lime detected. Moreover, in a general trade list which was shown to us, the two articles appeared under the same name "sulphur precipitatum," but with this distinction; the first was what the defendant calls "milk of sulphur," but attached to it was this note, "this contains sulphate of lime." The other, the price of which was exactly double that of the first, was described as "pure," and this really appears to be decisive on the whole question. Moreover,

in Dr. Pereira's Materia Medica, and in several other books of undoubted authority, the pure article is called by both names—lac sulphuris and sulphur precipitatum, and the impure one is not recognised at all, or, if it is, it is distinguished as containing sulphate of lime. This being the case, can it be just and right that the practice advocated by the defendant of selling the impure article under the same name and at the same price, as the pure should be allowed to continue? I think not, and it ought to be put a stop to, and therefore I am of opinion—and in this I am most happy to say I am borne out by Dr. Heslop, to whom I beg to record my deep obligation for the invaluable assistance which he has most kindly afforded me, though he is not responsible for the language in which I have conveyed my opinion or the reasoning which I have employed—that a person who sells as milk of sulphur an article which contains only one-third part of pure sulphur, and two thirds of plaster of Paris does sell to the prejudice of the purchaser, a drug which is not of the nature, substance, and quality of the article demanded by such purchaser. If, as is stated, there are many persons who prefer the impure article on the ground that it is more easily missible with water, by all means let them have it, but let them demand it *eo nomine*, and let it be sold with a distinctive label, stating, as in the trade list, that it "contains sulphate of lime." There can be no hardship in this to the druggist, but without such label I think it ought not to be sold as milk of sulphur. I should be very glad if the trade generally would have consented to adopt such a distinctive label, and to relieve me from the necessity of pronouncing a decision which will, I fear, give pain and offence to many most respectable tradesmen; but, as I must decide the question, I must do it according to what I believe to be consistent with law and common sense. It is a great comfort to me to know that my decision may be very easily questioned by an appeal to one of the superior courts, and it is most desirable that a matter which is considered of such importance—though I confess I think the importance is a good deal exaggerated—should be finally settled. My decision must therefore be in favour of the prosecution, but as the object is not to punish for an act the illegality of which has been denied, but to declare it illegal and prevent its repetition, I impose merely a nominal penalty of one shilling, and make no order about costs.

Mr. Tanner applied for a case, which was granted. He said he thought the better course would be to go to the Court of Queen's Bench instead of the Court of Quarter Sessions, and he should take the necessary steps in the matter.

To ensure greater strength the whole is fixed to a stout glass plate which is supplied with two spirit levels. The Balance is so arranged that it can easily be taken to pieces and put together again. The pieces, when apart, fit in a box, and can be carried about without any fear of injury in the transport. The knife edges and their supports are made of agate, and most carefully finished.

The form I have adopted for the smaller weights from 0·5 downwards will also be found very convenient. They are made of wire, turned up into a flat spiral, the inner end projecting and forming a little upright by which it can easily be taken hold of. The number of coils indicates the number of units in each decimal, and the decimals themselves are distinguished by different thicknesses of the wire.

An inspection of this Balance is respectfully solicited at my office, **55, Upper Marylebone Street, Portland Place, London, W.**

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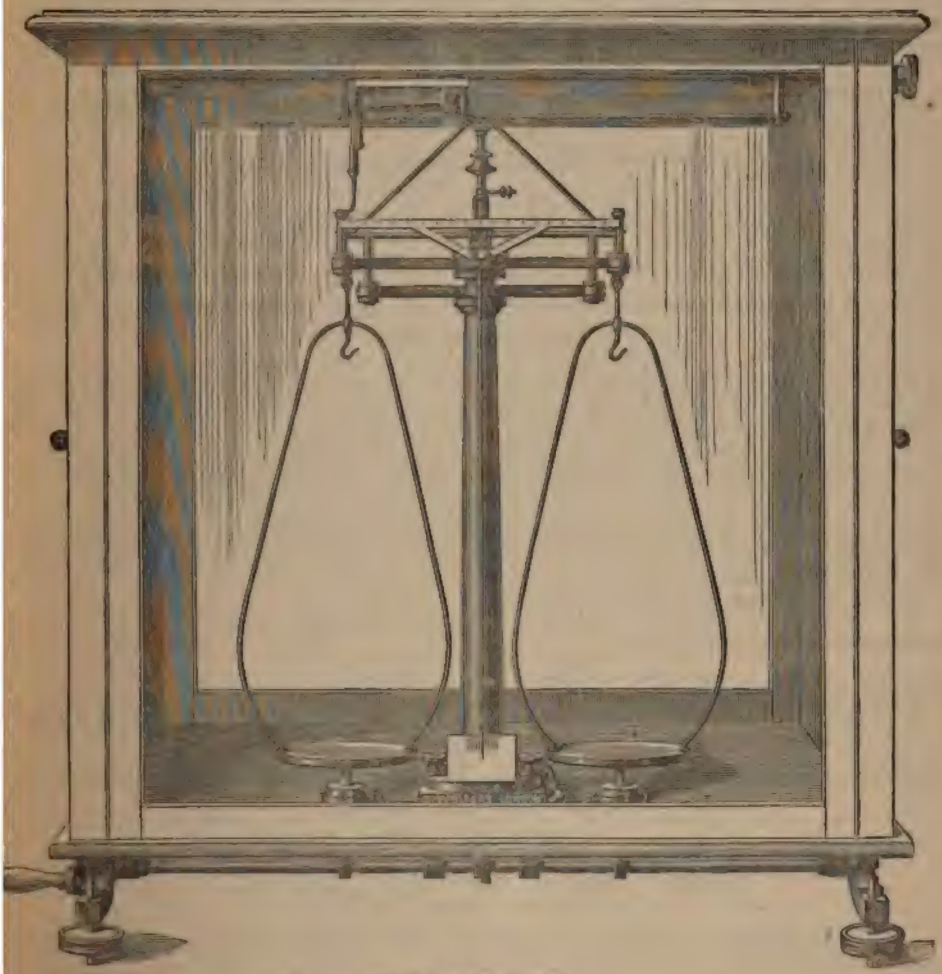

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THE ANALYST.

SOCIETY OF PUBLIC ANALYSTS.

On the 14th inst., an Ordinary General Meeting of the Society of Public Analysts was held, at Burlington House; the President (Dr. Redwood), occupying the chair.

After the formal business had been transacted, the Scrutineers (Messrs. J. H. Scott and H. H. Slater), reported that the following gentlemen had been elected as members of the Society:—

W. Bettel, Middlesborough; H. C. Bartlett, Ph.D., F.C.S., London; John Clarke, Ph.D., Glasgow; Otto Hehner, Ventnor; A. Bostock Hill, L.R.C.P., and L.S.A., Birmingham; J. A. R. Newlands, F.C.S., London; W. Thomson, F.C.S., Manchester; R. R. Tatlock, F.R.S.E., F.C.S., Glasgow; W. Wallace, Ph.D., F.R.S.E., F.C.S., Glasgow; James Baynes, Jun., F.C.S., Hull. The name of Mr. C. Harrison, Lincoln, who applied to be admitted as a member, was duly read in accordance with a rule of the Society.

The following papers were then read by their respective authors, and discussed:—

What is Milk of Sulphur? By Alfred Hill, M.D.; On the Composition and Analysis of Butter Fat, by A. Dupré, Ph.D., F.R.S.; On the frequent presence of Cane Sugar in certain samples of Wine, by C. A. Cameron, M.D., F.R.C.S.; On Mercuric Iodate, its preparation and re-actions, by C. A. Cameron, M.D., F.R.C.S. On some recent cases of Milk Adulteration, by E. W. T. Jones.

We regret that the pressure on our space necessitates our postponing till our next issue the publication of the paper by Dr. Dupré, and the two papers by Dr. Cameron.

WHAT IS MILK OF SULPHUR?

Read by Alfred Hill, M.D., *before the Society of Public Analysts, June 14th*, 1876.

To every medical man and student of chemistry and *materia medica*, well informed, the answer is simple enough. It is sulphur reduced to a minute state of division by precipitation from chemical solution.

In a case recently heard at Coleshill, which has been widely published, I endeavoured, without success, to convince the Magistrates that precipitated Sulphur and Milk of Sulphur are one and the same thing. It was maintained successfully by the Defendant that Sulphur precipitatum is not Milk of Sulphur, and that a mixture of precipitated Sulphur and sulphate of Lime is exclusively properly so termed. Sometimes a different view is taken by magistrates, but more frequently not, and I think it will be profitable to us, as Public Analysts, to consider for a short time this very practical question.

The sample upon which proceedings were taken contained 59.75 per cent. of crystallized calcium sulphate, and the correctness of this statement was not disputed. The defence in effect was that the puschaser had been supplied with the article which he demanded, and that the alleged adulteration was covered by the sub-section of the Act which said "that no offence should be deemed to have been committed where any matter "or ingredient not injurious to health had been added to the food or drug, because the "same is required for the production or preparation thereof as an article of commerce."

I will state the chief points of the defence as briefly as possible.

That the Pharmacopœia of 1724 called the preparation *lac sulphuris*, and it ordered the preparation to be made from lime and sulphuric acid.

That the sulphate of lime is a necessary ingredient of the drug.

That it was necessary to enable the drug to mix with water.

That the sulphate of lime increased the activity of the drug.

Mr. Alfred Bird totally disagreed with Dr. Hill's statement.

Mr. Bird stated "milk of sulphur" to be a distinct preparation from sulphur precipitatum; he had known that ever since he was an apprentice. He had always sold the two articles as perfectly distinct. Milk of sulphur was not an impure article. He stated that he had always sold the lime compound for milk of sulphur, and he always should. Chemists dare not sell anything else than this mixture for milk of sulphur. Mr. Bird further stated that the *cheaper* article is sold because it is the most beneficial. Precipitate of sulphur was only produced as a *chemical curiosity*, and there was no use specified for it in the London Pharmacopœia. It was only *ignorant* medical men who did not know the difference between the two. Trade lists of chemicals were put in to prove that they were distinct articles. Mr. Croxall said the bench were of opinion that there were two articles known to the trade as milk of sulphur and sulphur precipitatum, and that the sample sold was a fair sample of milk of sulphur. The summons would therefore be dismissed.

In answer to these statements I say that the Pharmacopœia of 1724 did not order *lac sulphuris* to be made with lime, but either with lime or carbonate of potash, as alternative methods. That the sulphate of lime is not a necessary ingredient of the drug. That the sulphate of lime is not necessary to enable the drug to mix with water, as water is not a proper medium in which to administer it. That instead of increasing the activity if the drug it diminishes it *pro ratâ*. That instead of chemists not daring to sell pure precipitated sulphur when asked for milk of sulphur, I say that out of 13 samples of milk of sulphur lately purchased by the Birmingham inspector, 10 were perfectly pure, and of 12 samples purchased in Birmingham since the Coleshill case 6 were pure. One of the latter was labelled "Pure Milk of Sulphur," showing that some chemists regard both kinds as milk of sulphur. One was a mixture of precipitated sulphur, sulphate of lime, and *flowers of sulphur*. It is untrue that the cheaper substance is sold because it is the most beneficial; the witness must have meant most beneficial to the seller as it is certainly not so to the buyer.

Although drug lists, judiciously selected, were put in to prove Defendant's case, I have since found drug lists which prove the opposite, *e.g.*, Burgoyne, Burbidges & Co.'s list describes both kinds as sulphur precipitatum, the one "*commercial*," containing sulphate of lime, and the other "*pure*;" while the list of Hodgkinson. Prestons & King, designates them both *lac* sulphuris, one being distinguished as "Pur. P.B."

As the whole question in the Coleshill case turns on the point of identity or non identity of milk of sulphur and precipitated sulphur, I propose to enquire what are the opinions of various authorities of repute, published during the last century and a half, as far as I have been able to consult them.

Dr. Thomas Thomson in his "Elements of Chemistry," published as far back as 1810, on page 13 states, "When sulphur is dissolved in any liquid, as in a solution of potash, and then precipitated by an acid, it is always in a state of white powder, known by the name of "*lac sulphuris*." This sentence needs no comment, because the introduction of sulphate of lime is impossible, but the substance is nevertheless called *lac* sulphuris.

Brande, in his "Manual of Chemistry," vol. 1, page 38, says, "For some pharmaceutical purposes sulphur is precipitated from its alkaline solutions by an acid, and, when washed and dried, is in the form of a yellowish-grey impalpable powder; this is the *milk of sulphur and precipitated sulphur* of the Pharmacopœia." There is nothing here

to justify the inference that milk of sulphur must contain sulphate of lime, but, on the contrary, that it may be formed from any alkaline solution, whether calcareous or not.

In the "Chemistry" of Brande & Taylor, 1863, p. 237, is a similar passage, thus, "For some pharmaceutical purposes sulphur is precipitated from a solution of tersulphide of potassium or pentasulphide of calcium by hydrochloric acid, and when washed and dried it forms a pale yellowish-grey impalpable powder; this is the *milk of sulphur and precipitated sulphur* of the Pharmacopœia." Here again the sulphur precipitated by the special acid mentioned, the hydrochloric, or from sulphide of potassium, is called milk of sulphur, when of necessity sulphate of lime is excluded.

Muspratt, who is an excellent authority on such a question as this, says, "Sulphur occurs in commerce in another form intended expressly for medical use. When in this shape it is called *milk* of sulphur, and consists of sulphur in a very minute state of division. . . . . . Lime is almost invariably used by the manufacturers as a solvent, but they are *guilty of substituting sulphuric acid for hydrochloric as a precipitant.* By so doing, instead of forming the soluble chloride of calcium, which is easily removed by washing, they form the very insoluble sulphate of lime, which mixed with the sulphur, forms the article commonly sold by druggists as milk of sulphur, and thus what should be pure sulphur is contaminated by this worse than useless sulphate of lime, often to the extent of more than 50 per cent. In one sample obtained from a druggist, and which was stated to be pure, 56 per cent. of sulphate of lime was found. It is useless to argue that such a sophistication is harmless, for, although not positively poisonous, the introduction into the stomach and bowels of a quantity of this insoluble matter cannot but be productive of harm."

In Gmelins' Handbook of Chemistry, Vol. I, p. 159; translated by Henry Watts, for the Cavendish Society, we find:

Milk of Sulphur, Lac Sulphuris. Sulphur separated in the cold from aqueous solutions containing hydrosulphuric acid. To obtain it, prepare one of the following solutions: (*a.*) An aqueous solution of liver of sulphur. (*b.*) The solution *a*, thoroughly saturated by boiling with sulphur. (*c.*) Sulphide of potassium obtained by igniting sulphate of potash with charcoal, then dissolved in water, and the solution saturated with sulphur at a boiling heat (Bucholz). (*d.*) Solution of caustic potash boiled with sulphur till saturated. (*e*). One part of quicklime slaked with three parts of water, and then boiled with two parts sulphur and thirteen parts water. One of these liquids, after being left to stand for some days, then filtered and properly diluted with water, is precipitated by sulphuric, hydrochloric or acetic acid free from metal. With *e* only hydrochloric or acetic acid can be used.

In the manual of Materia Medica, by Royle, 3rd Edit., 1856, page 29, we find: "Sulphur precipitatum, L. precipitated sulphur. Lac sulphuris or milk of sulphur. This is omitted from the other British Pharmacopœias, on account of its impurity, nearly two-thirds by weight of that of the shops being sulphate of lime. To prepare it, one part of sublimed sulphur is boiled with two parts of slaked lime in eight parts of water. To the solution thus produced, which contains sulphuret of calcium and hyposulphite of lime, hydrochloric acid is added in sufficient quantity to form with the lime, chloride of calcium and sulphur is precipitated. Sulphuric acid may be *fraudulently* substituted for hydrochloric when sulphate of lime falls down with the sulphur."

In the 6th Edition, 1876, the heading is the same with the substitution of P.B. for L., and the following remarks: "Precipitated sulphur is now generally disused on account of the *fraudulent* substitution of sulphuric for hydrochloric acid in its preparation. When the former acid is used both lime and sulphur are precipitated, the former as insoluable sulphate, forming the chief portion of the precipitate."

Dr. Attfield, a high authority on Pharmaceutical Chemistry, says: "By far the larger proportion of precipitated sulphur met with in commerce is still (1867) adulterated with sulphate of calcium," and he calls the adulteration a "fraud.

Dr. Muter also regards the terms lac sulphuris and sulphur precipitatum as synonymous.

Perhaps it would be difficult to find a better authority on Materia Medica, than the late Dr. Pereira, a Doctor of Medicine, a Fellow of the Royal Society, a Fellow of the Royal College of Physicians of London, a Professor of Materia Medica and Examiner in Materia Medica in the University of London, and presumably as well qualified by his education and general and special knowledge and experience as Mr. Bird.

In the 4th Edition of Pereira's Materia Medica, vol. 1, p. 357, we read: "Sulphur precipitatum, precipitated sulphur; lac sulphuris or milk of sulphur. The precipitated sulphur of commerce is most extensively *adulterated* with sulphate of lime. In its preparation, sulphuric acid has been substituted for hydrochloric acid by which the product contains nearly two-thirds its weight of crystallised sulphate of lime." And in "Neligan's Medicines, their uses and mode of administration, 7th Edition, 1867, by Rawdon Macnamara, L.R.C.P., Professor of Materia Medica in the Royal College of Surgeons of Ireland," under the heading, Sulphur Sublimatum, p. 23, is the following remark, "precipitated sulphur, which was at one time very generally employed instead of sublimed sulphur has *nearly fallen into disuse* in consequence of the very impure state in which it is sold; It has however, been introduced into the British Pharmacopæia, and a formula has been given for its preparation."

These extracts clearly prove that precipitated sulphur, whether produced from sulphides of potassium, sodium, or calcium by sulphuric acid, hydrochloric acid, or acetic-acid, and therefore, whether perfectly pure, or mixed with sulphate of calcium, has been for 150 years, and still is properly designated by either the term, *lac sulphuris*, *milk of sulphur*, *sulphur precipitatum*, or *precipitated sulphur*, all of which are synonymous terms.

Dr. Paris in his celebrated work, "Pharmacologia," 1822, writes—sulphur precipitatum, L. lac sulphuris, P.L. 1720. This *when pure*, differs, in no other respect from sublimed sulphur, than in its superior whiteness, which it owes to the presence of a small quantity of water."

Dr. Ballard in his Materia Medica sets down the two names as synonymous, and the same with every author on materia medica or chemistry, whom I have been able to consult.

Much stress was laid by the defence in the Coleshill case, on the statement that the precipitated sulphur of the early pharmacopœias was made from lime and sulphuric acid, and that sulphur so precipitated in association with sulphate of lime, is the only true *lac sulphuris* or milk of sulphur, and something totally distinct from sulphur precipitated alone, or without sulphate of lime. I was not prepared at the time for this assertion

never dreaming that such a contention would be put forward, or it would have been easy to have refuted it by this very Pharmacopœia of 1724, which was produced in order to prove the defendant's case. On subsequently referring to this Pharmacopœia of 150 years ago, it appears that only so much was quoted by the defence as was thought desirable. The following is the recipe for the preparation of "Lac Sulphuris" in the Pharmacopœia Collegii Regalis, Londinensis, 1724.

Sulphuris partem unam.

Calcis vivæ vel *Salis Tartari* (*i.e.*, carbonate of potash) partes tres. coque in aquae fontanae: q.s. ad solutionem sulphuris, filtra, calide, praecipita cum Spiritu Vitrioli edulcora et sicca.

It is here seen that the name of the preparation is "Lac Sulphuris" and no Sulphur Precipitatum, also that this "Lac Sulphuris" consists of sulphur and sulphate of lime, if the quicklime be used, but of pure sulphur, that is without sulphate of lime, if the alternative method by Salis Tartari, or carbonate of potash be used. No other illustration is needed to refute the statement that the term milk of sulphur is applied only to the mixture of precipitated sulphur, with sulphate of lime, because we see that it is referred with equal authority to that which is prepared in such a manner that the presence of the alkaline earth-salt is impossible.

In the London Pharmacopœia of 1746, singularly enough, while the preparation is directed to be made with lime, and diluted spirit of vitriol, the term "Lac Sulphuris" is dropped, and that of "Sulphur Precipitatum" substituted for it. This is still further proof of the falseness of the contention, that the term milk of sulphur refers to a mixture of sulphur and sulphate of lime, while precipitated sulphur is the sulphur without the sulphate of lime, for now it appears that just the reverse is the case.

In the London Pharmacopœias of 1763 and 1771, the directions for the preparation of "Sulphur Precipitatum," (there is now no mention of the term "Lac Sulphuris,") are the same as in that of 1746, but in the Pharmacopœia of 1788, an intelligent change is observed, the lime, sulphur and vitriol process of the three previously mentioned works is abandoned, and an improvement is also made upon the double process of the 1724 issue, which was really better than those of the three subsequent Pharmacopœias in giving a good as well as a bad process, for now though sulphuric acid or vitriol acid, as it is here for the first time called, is retained, lime is banished altogether, and potash is substituted for it, thus there are ordered prescribed quantities, kali sulphurati, *i.e.*, (liver of sulphur) aq: distillat and acidi vitriolici diluti, and so the sulphur which is precipitated is free from lime, or any other admixture.

To the chemist of the present day, these changes, and the earlier crude processes appear very strange antiquated and even grotesque, but it must not be forgotten that we have the advantage of living in times when modern chemistry has undergone a most unparalleled impetus and development, and we have much to be thankful for in this respect, but in 1721, and onward to the end of the eighteenth century, the science of chemistry, as we know it, was only in its infancy, and its efforts were naturally weak and unsteady. Evidence of increasing growth and strength is however given in the improved formula of the Pharmacopœia of 1788, and this is still more noticeable in that of 1808, when the cheaper lime was again ordered to be used in place of the costlier potash, and the difficulty of contaminating the precipitated sulphur by sulphate of lime was obviated by the introduction of muriatic in place of the sulphuric acid.

It occurs to me that the long use of sulphuric acid was due to the greater readiness with which it was obtainable, having been well-known from the time of the Alchemists, and being at that time easily produced by the distillation of green vitriol, while muriatic acid seems to have been rarer and much less employed. As the latter became more common and cheaper, it would naturally be brought into use, in many cases where sulphuric acid had been used before. However,* this may be, muriatic acid introduced for the preparation of precipitated sulphur in the Pharmacopœia of 1808, has ever since maintained its place.

If any doubt remained upon the question of the terms *lac sulphuris* and *sulphur precipitatum* being synonymous it is set at rest by the translation of the London Pharmacopœia of 1851, by Richard Phillips, F.R.S.L. & E., F.G.S., late President of the Chemical Society, Curator of the Museum of Practical Geology; in which we find Sulphur Precipitatum, P.L. 1824, Precipitated Sulphur; Lac Sulphuris, P.L. 1721; Sulphur Precipitatum, P.L. 1746; P.L. 1788; P.L. 1809.

Impurities, Adulterations and Tests, Dilute Sulphuric Acid is often employed in the preparation of Precipitated Sulphur, and it then is largely *contaminated* with sulphate of lime, which is easily detected by the tests in Materia Medica (Sulph. Precip.)

Medicinal Uses. The same as sulphur, to which *when properly made* it is to be preferred.

Not only is the identity of the two substances here distinctly declared, but the article containing lime is said to be contaminated and the opinion is expressed that *when properly made*, that is when free from Sulphate of Lime, it is a valuable medicine, leaving it to be inferred that when not properly made it is an inferior article.

The *Pharmacopœia Gallica* of 1818, recommends that sulphur be boiled with either potash, soda, or lime, in water, and that the sulphur be precipitated from its alkaline solution by the addition of acetic acid, and the same form is given in the *Pharmacopœia Français* of 1819.

So that though lime is or may be used according to the Pharmacopœia of the two countries, its precipitation is obviated by the use of acetic acid.

The *Pharmacopœia Borussica* (Prussian), 1829, under the heading "Sulphur Prœcipitatum (Lac Sulphuris)," orders the substance to be prepared from caustic potash, sulphur and sulphuric acid; in this case though sulphuric acid is used, the introduction of calcium sulphate is carefully avoided by the use of potash in place of lime. Then follows the remark, "totally volatile," implying that no lime must be present. In the 1846 edition of the same Pharmacopœia, under the same heading, the article is directed to be prepared from calcaria, sulphur and hydrochloric acid. Lime is here introduced probably because it is cheaper than potash, but the same care to exclude impurity is exhibited by the substitution of hydrochloric for sulphuric acid.

If we consult the chemical works, not Pharmacopœias, of other countries, we find that the use of lime, so as to contaminate the precipitated sulphur with a lime salt is carefully avoided. This has been already partly shewn by the quotation from the English translation of Gmelin's Handbook, and if we consult other German authorities, we find that not only is the same object always kept in view, but also that in this careful exclusion of lime, the sulphur which is precipitated is still distinctly called *milk* of sulphur or its equivalent; thus "Schwefelmilch" is the common German name for Gefällter Schwefel, just as milk of sulphur is the common English name of precipitated sulphur.

The quotations I have made, shew clearly that there is no reason whatever for the assertion that there is a distinction between the terms milk of sulphur and precipitated sulphur, they show that milk of sulphur containing lime, is an antiquated, impure and long abandoned form of the drug, and it ought therefore no longer to be sold. The drug is weakened in its action by dilution with the lime salt, and in cases where it is habitually used the lime is highly calculated to prove injurious. Not only is the drug weakened by the admixture, but the dose is enormously increased in bulk, a great objection in an already bulky substance; the presence of the lime salt commonly increases the necessary dose 150 per cent., for if a person requires a dose of 2 drams of actual sulphur, he must take 375 grains, or nearly an ounce of some such samples as I have examined ,a quantity quite sufficient to deter any ordinary person from its use.

Although the hearing of the Coleshill case resulted in its being dismissed, I felt convinced that if a similar case could be heard, the decision must be given in favour of the principle of pure medicines, and this conviction has been realised by a case tried at Birmingham, on the 22nd May, the decision upon which was given by Mr. Kynnersley, on the 29th May, and a copy of which appeared in No. 3 of "*The Analyst*," which, no doubt, every member of the Society has seen.

This Birmingham sample contained no less than 67 per cent. of sulphate of lime, or more than two thirds of its weight.

It seems to me a great mistake that druggists who pride themselves on the advances which as a body they have really made, through the improved, general, and pharmaceutical education they have latterly received, should constitute themselves champions of an impure drug. I cannot help thinking they would be much better consulting their own reputation and public interest by dealing only in the pure article. To say that the people prefer the impure sort is absurd, for it is inconceivable and opposed to my professional experience, that the public know the difference or even that two distinct sorts exist; but assuming for the sake of argument, that they do know, it is the duty of every druggist worthy of the name, to educate the public by explaining the difference and refusing to supply the impure kind; but says Mr. Bird, no chemist dare sell the pure precipitated sulphur if asked for milk of sulphur, then I ask how is it that out of thirteen samples bought in Birmingham on the same day, by the name of milk of sulphur, three only contained sulphate of lime and ten were perfectly pure, and consisted of Mr. Bird's "chemical curiosity," and I would further call to mind that one of the defendant's witnesses in the Birmingham case, himself a druggist, astonished the court, and no doubt the trade representatives who brought him forward, by stating in evidence that he kept only one kind, the pure, and that when a customer came to his shop for milk of sulphur he supplied him with this pure precipitated sulphur.

This is no doubt the truth, and very creditable it is to the druggist in question, who, however, does not stand alone in this matter, for as we have seen ten druggists out of thirteen in one day similarly supplied the pure article. I trust I have succeeded in satisfactorily answering the question at the head of my paper, in proving that milk of sulphur and precipitated sulphur are not two substances recognised as distinct by either scientific chemists or medical men, ancient or modern, but that the distinction is merely technical among only some druggists for trade purposes, and one with which, therefore, we as Analysts have nothing to do in carrying out the provisions of the sale of Food and Drugs Bill. To my mind there is not the least doubt that both names indicate the same article, of which there are two sorts in the market, a pure and an impure, and that it is the duty of both Analysts and Medical men to do all in thei power to suppress the use of that which is adulterated.

Mr. Allen said that the history of *lac sulphuris*, as given by Dr. Hill, was extremely interesting, but a similar preparation was described in several older works than the Pharmacopœia of 1721. Thus in one case, "sharpionic or spirit of vinegar" was ordered to be used, and in another this was replaced by hot urine. Leaving the question of the exact meaning of the term "milk of sulphur" to be fought out between Dr. Hill and the druggists, Mr. Allen said he avoided the question by directing that "precipitated sulphur" should be asked for. The result appeared to be exactly the same, the "adulterated variety" (as it was called by Pereira) being frequently sold even when "precipitated sulphur" was specially asked for. He had no doubt that it would be as warmly contended by these vendors that milk of sulphur and precipitated sulphur were identical, as it was in Dr. Hill's cases that they were entirely different preparations.

It was curious that in one of the cases in which Dr. Hill was concerned, he stated the amount of sulphate of lime contained in the sample as considerably greater than that found by Mr. Bird, the gentleman employed by the defence. A little knowledge was a dangerous thing, and it appeared highly probable that the discrepancy was due to Mr. Bird's having been aware that sulphur was volatile and the impurities fixed, but ignorant of the fact that the residue left on ignition required to be calculated into the hydrated sulphate of calcium before its weight could be held to represent the extent of contamination of the original sample.

Mr. Allen had recently examined several samples which had been sold as "precipitated sulphur," and the results were of some interest. Two were genuine, one contained sulphate of calcium, and another consisted of the orange oxysulphide of antimony. The vendor of the latter sample pleaded in defence that he had been in business thirty years, and a medical man was called as a witness to his accuracy in dispensing. The defendant stated that he was well acquainted with the difference between the two preparations, and the purchaser asked for "precipitated sulphur of antimony." It was shown, however, that the sub-inspector who purchased the article had never heard of such a substance, and had read the words "precipitated sulphur" from his note-book, without knowing what kind of preparation he was to expect. The vendor was ultimately fined 50s. and costs, and subsequently admitted to the inspector that when he asked for "precipitated sulphur" he could not think what stuff was meant, and sold the antimony as the article probably required. The same druggist has also recently furnished the first conviction under Section 7 of the Sale of Food and Drugs Act, for selling a compounded drug not compounded in accordance with the demand of the purchaser. A mixture made up by him from a physician's prescription was found to contain 247 grains of iodide of potassium instead of 160 as ordered—at least the portion of the sample submitted to Mr. Allen contained 24·7 grains per ounce. As it seemed possible that the large excess present was due to imperfect mixing of the sample before division, Mr. Allen had the inspector's portion opened by a magistrate's order, but the analysis of this fully confirmed that of the original analyst's portion, and the defendant was fined 50s. and costs. At the hearing the vendor's solicitor made an ingenious defence based on the imperfect admixture theory, and was considerably disgusted on discovering that Mr. Allen had anticipated the objection and had provided against it by procuring the analysis of part of the inspector's portion.

In four other cases a prescription was submitted containing "precipitated sulphur" as the chief ingredient, and in two of these sulphate of calcium was found.

Mr. Allen concluded by calling the attention of the Society to a very probable contamination of precipitated sulphur, especially when it was obtained as a secondary product, as was now frequently the case. If the hydrochloric or sulphuric acid used were contaminated with arsenic, this dangerous impurity would be precipitated as sulphide along with the sulphur.

The common employment of sulphuric instead of hydrochloric acid was easily explained, as it was only since the enforcement of the Alkali Acts that the latter acid had been able to compete with the former, and that would be still more the case before the present method of soda manufacture became general.

Dr. Redwood said he entertained a very different opinion from that which had been expressed by the author of the Paper. He thought there were two distinct questions involved in the consideration of the subject relating to the sale of milk of sulphur, and he wished to offer a few remarks with reference to both the questions, which were as follows:—

1. Are the terms "milk of sulphur" and "precipitated sulphur" strictly and necessarily synonymous, or may they not be legitimately, as they often are in practice, used to signify two different things?

2. Is the preference which many persons give to the sort of precipitated sulphur, commonly called milk of sulphur, containing sulphate of lime, in comparison with the precipitated sulphur of the British Pharmacopœia, founded on any real and substantial advantages which the former possesses over the latter; or does it originate in and is it entirely founded upon an ignorant prejudice which it is the duty of druggists to endeavour to remove?

With reference to the first of these questions, he considered that the term "precipitated sulphur" could only be correctly taken to mean the preparation described under that name in the present Pharmacopœia, and no druggist was justified in supplying under such name an article containing a large quantity of sulphate of lime; nor should the interpretation be confined to cases in which precipitated sulphur was ordered by a medical man, but it should also apply to its sale to the public for use as a domestic medicine, unless the person selling it had reason to believe, from something conveyed or implied, that the article popularly known as milk of sulphur was preferred and required. But although there should be no doubt as to the meaning of the term "precipitated sulphur," especially among druggists who were supposed to understand and to be governed by the requirements of the Pharmacopœia, it was otherwise with reference to the term "milk of sulphur." This term, or its Latin representative, *lac sulphuris*, was first used officially in the London Pharmacopœia of 1721. Dr. Hill would excuse him for calling his attention to the date of issue of the Pharmacopœia in which the formula was first given, which was 1721 and not 1724 as stated in Dr. Hill's paper. As described in that formula, milk of sulphur was directed to be made by dissolving sulphur in water by means either of lime or salt of tartar, and then precipitating with sulphuric acid, thus yielding, in one case, a mixture of sulphur with sulphate of lime, and in the other sulphur, without sulphate of lime. At that time, clearly the term "milk of sulphur" meant either of those preparations. It might be fairly supposed that both the methods indicated in the Pharmacopœia were sometimes adopted, and that those who used the article were therefore enabled to compare the two products. It might be also

concluded that a preference was given even then to the preparation containing sulphate of lime, for, in the next edition of the Pharmacopœia, in 1746, the alternative method of dissolving the sulphur with salt of tartar was omitted. It was worthy of remark that this was the first edition of the London Pharmacopœia in the preparation of which scientific knowledge had been brought to bear, yet although prepared under the direction of a scientific committee, the preparation containing sulphate of lime was retained under the name of precipitated sulphur, while the other name and preparation were dropped. At that time, then, namely 1746, and up to 1788, the name "precipitated sulphur" was officially applicable only to the preparation containing sulphate of lime, while the name "milk of sulphur" signified either that article or sulphur free from sulphate of lime. In 1788, for the first time, hydrochloric acid was directed to be used for precipitating the sulphur, and since that time precipitated sulphur has always officially signified sulphur, not pure, but free from sulphate of lime. Such being the history of the official introduction of the two articles referred to, and of the use of the names "milk of sulphur" and "precipitated sulphur," he (Dr. Redwood) had always considered, and he still maintained, that the name "milk of sulphur" had a double meaning, and that while it might be looked upon as a synonym for precipitated sulphur, it was at the same time equally applicable, and was in fact the only name that would be popularly understood and that could be applied to the preparation of sulphur with sulphate of lime, which had received the sanction of two committees of the London College of Physicians and for centuries had been used and approved of by a large proportion of the public who were in the habit of using milk of sulphur. He denied therefore that milk of sulphur which contained sulphate of lime was an adulterated article. It was one of the varieties of precipitated sulphur which had been sanctioned by medical authority, and still more by the opinion of those who were accustomed to take it, and who, with reference to an article of this kind, were capable of judging of its effects, and were justified in refusing to be supplied with a different article, to which they objected. This was not the only case in which a name which had been used in a superceded Pharmacopœia, and which had been replaced by an altered name as applied to an altered formula, had been used legitimately and properly to designate the preparation to which it was originally applied, and to distinguish such from the succeeding representative of that prepapation. In confirmation of this he might allude to the cases of paregoric elixir, and cathartic extract or compound extract of colocynth, the former as modified in composition by the London Pharmacopœia of 1809, and the latter as modified in 1851. He could not suppose that those present would be able fully to appreciate the difficulties often experienced by druggists in meeting the requirements of the public in the supply of popular medicines, such as those he had named and several others.

With reference to the second question, he considered that milk of sulphur containing sulphate of lime possessed real and substantial advantages over the other preparation, which justified the preference given to it by the public. Not only was it less disagreeable in taste and smell, more easily mixed with water, and more easily taken because it did not, as the other did, stick about the mouth in attempting to swallow it; and all these were important qualities in a medicine often given to children; but in addition to these qualities it would be found, if the two preparations were properly examined, that the sulphur existed in milk of sulphur in a more pure and less nauseous state than that

in which it existed in precipitated sulphur. The method usually adopted in examining these preparations afforded a very imperfect insight into their respective natures. By the application of heat one was volatilised entirely and the other left a residue of sulphate of lime, from which it was inferred that one was pure sulphur and the other was not. If examined in another way, however, a different conclusion might be arrived at. Let each powder be treated with bisulphide of carbon, by which the sulphur would be dissolved, leaving in one case a dark-coloured oily residue of persulphide of hydrogen, and in the other case pure silky crystals of hydrated calcic sulphate. If he were going to take precipitated sulphur himself or to give it to a child, he would prefer it with the latter rather than the former admixture. The sulphate of lime, he believed, rendered the sulphur more active, not only by its stimulating action on the intestinal canal, like that of cream of tartar in the *confectio sulphuris* of the Pharmacopœia, but also by its mechanically dividing the particles of the sulphur and rendering it diffusible in the contents of the stomach; while the oily persulphide of hydrogen which precipitated sulphur contains breaks up in the stomach into sulphur and sulphuretted hydrogen which causes disagreeable eructations. He had no hesitation, therefore, in saying that in his opinion the term, milk of sulphur, was correctly and legitimately used to designate a preparation of sulphur containing sulphate of lime, which had been authorised by the College of Physicians under that name; and further, that this preparation was preferable in several respects and possessed substantial advantages over the precipitated sulphur of the present Pharmacopœia.

In reply Dr. Hill could not understand why the President should consider that the Pharmacopœia of 1846 ordered a mode of preparation containing lime, because that Pharmacœpia was more scientific than previous ones, for the Pharmacopœia of late times followed a totally different course, and it could hardly be contended that they are less scientific than those of the eighteenth century. But if they are more scientific it is clear that the directions set forth in them are the best, and these we know are specially framed with a view to avoid the admixture of a lime salt.

That sulphur precipitated with lime is purer than sulphur precipitated without lime is a question not to be seriously discussed, and if the question were followed out it would lead to the conclusion that 67 per cent. of sulphate of lime being an improvement 97 per cent. would be a still greater advantage, and that the exclusion of sulphur altogether would bring the drug to its very highest state of activity and efficiency.

THE MICROSCOPICAL STRUCTURE OF CERTAIN FRUITS AND ROOTS TO BE MET WITH IN THE JAMS AND PRESERVES OF COMMERCE.*

By Arthur Angell, F.R.M.S.,

Public Analyst for the County of Hants.

This Pamphlet contains lithographic reproductions of a series of Camera lucida drawings of the structures of the fruits most commonly used in the manufacture of jam. The literary part consists chiefly of a clearly written introduction, and of tables which serve as a key to the engravings. The drawings themselves have evidently been executed with care, and, in some cases, we can ourselves verify their accuracy. The Book will, undoubtedly, be of value to all analysts engaged in the microscopical examination of fruit or jam.

* Gilbert, High Street, Southampton.

WEST BROMWICH MILK CASES.

By E. W. T. Jones, F.C.S.

Read before the Society of Public Analysts, June 14th, 1876.

On the 10th February last, amongst other samples were submitted to me, two of milk marked respectively 40 C, and 43 C, which I analysed with the following results:—

	40 C.	43 C.
Solids not Fat	7·96	8·15 per cent.
Fat	2·57	3·50 "
Total Solids	10·53	11·65 "
Ash	0·62	0·64 "

The analysis being repeated, gave corroborative figures, so I certified that 40 C contained 14 per cent., and 43 C, 12 per cent. of added water. Summonses were taken out, and on the cases coming on for hearing, numerous arguments were advanced to show that the proceedings were irregular. These failing, however, the only chance of getting the cases dismissed was to prove that the milks were genuine by analysis.

Now it subsequently came to light, that the portions left with the vendors had been analysed with results confirmatory of mine, but the defendant elected to have the inspector's portions submitted to the Somerset House chemists, they were received by them on the 9th May, and as a result of their examinations, the following certificates, came to hand:—

INLAND REVENUE LABORATORY.

Somerset House, London,
18*th May,* 1876.

[*Report on Sample of Milk marked No.* 40 C.]

The sample was received here by post on the 9th inst., in a bottle securely sealed. The milk was in an advanced state of decomposition, the gas evolved having evidently burst the bottle, and a portion of the milk was lost. From the position of the bottle, the milk lost would probably contain more fat than the portion remaining, but the amount of solids not fat would not be materially affected thereby.

As we have stated in our certificate relating to sample 43 C, the decomposition has the effect of reducing the proportion of solids not fat, and this circumstance has to be taken into account when considering the results yielded by the residue in the bottle. The results are as follow:—

Solids not fat	8·14	per cent.
Fat	2·43	"
Water	89·43	"
	100·00	
Ash	0·66	
Free Acid estimated as Lactic Acid	0·68	

After having made the necessary addition to the amount of "solids not fat," to compensate for the loss by decomposition, the total is low for a genuine milk, but not lower than has been frequently found in genuine samples.

The amount of "fat" contained in the residue is lower than is usually found in genuine milk, but as the sample in this case was only a partial one, we cannot draw any conclusion from this fact.

The "ash" is not lower than is found in many genuine milks.

We very much regret that we are unable throught the accidental loss of a portion of the milk, to form a definite opinion upon the character of the sample, and to render the magistrates greater assistance in coming to their decision in the case.

(*Signed*) J. BELL,
R. BANNISTER,
G. LEWIN.

INLAND REVENUE LABORATORY.

SOMERSET HOUSE, LONDON,
18*th May*, 1876.

[*Report on Sample of Milk marked No.* 43 C.]

THE sample was received by post on the 9th inst. The bottle was securely sealed. The milk was in an advanced state of decomposition, having gone beyond the lactic fermentation. This decomposition would naturally affect the proportion of solids not fat as compared with the quantity present in the milk when fresh, and an allowance must be made for the loss in question in determining whether water has been added or not. The results of our analysis are as follows:—

Solids not fat	8·14	per cent.
Fat	3·50	„
Water	88·36	„
	100·00	
Ash	0·78	
Free Acid estimated as Lactic Acid	0·92	

When the necessary allowance for "solids not fat," lost by the decomposition of the milk has been made, the amount is lower than is present in milk of first quality, but not less than is frequently found in genuine milk of low quality.

The quantity of "fat" represents a milk of fair quality, and exceeds the proportion found in many genuine milks.

It will be observed that the percentate of ash is ·78, and there are very few milks found to contain a larger proportion of ash than this amount, whilst the great bulk of genuine milks contains a smaller proportion. This in our opinion is an important fact in judging as to the character of the sample.

Under these circumstances we do not feel justified in pronouncing the milk to be adulterated with water.

(*Signed*) J. BELL,
R. BANNISTER,
G. LEWIN.

I would draw attention to the agreement between our respective analyses, which is the more remarkable, considering the age of the samples when last analysed, and the decomposition alleged to have taken place. I cannot quite satisfy myself whether an allowance *has* been made for the decomposition, and the lactic acid found included in the figure of "solids not fat," but it will be noticed that the 100 is made up with three terms, viz.: "solids not fat," fat and water, and so the tabulation strictly considered, appears to show that such an allowance has been made, in which case the composition of the original milk has been arrived at with wonderful correctness, but I am rather inclined to think that the percentages given are the results of the usual analytical method of procedure, without any correction for lactic acid, &c., and that a speculation has been made as to what the composition was originally. Under either circumstances, I submit it would only have been fair of the Somerset House chemists to have added to "we do not feel justified in pronouncing the milk to be adulterated with water," but owing to the decomposition, there is some uncertainty about the matter. I shall be glad to hear comments upon these cases, because I hold they have an important bearing with all Public Analysts, since if prosecutions cannot be sustained against vendors of such milks as these, the quality of our milk must go back to the old state, and milk examination be practically useless.

I give a tabulation of the first 20 milks examined under my appointment for South Staffordshire, and of the next 20 after some heavy fines had been imposed, showing a marked difference. I also show the composition of 20 submitted from December 6th, 1875, to January 6th, 1876, and also of 4 submitted the same day as these in question, and of 5 received two days after. All these figures refer to milks purchased by the inspectors for analysis and taken seriatim, they therefore, show the character of the milk retailed in the district—

MILKS.

1873. Dec. 15. 1st 20 under S.S. appt.

S. n. F.		Fat.		Ash.
8·94	...	3·34	...	·75
8·22	...	1·95	...	·51
10·60	...	3·12	...	·68
9·95	...	2·35	...	·65
10·66	...	2·29	...	·80
4·81	...	1·67	...	·41
6·83	...	1·66	...	·50
10·18	...	2·38	...	·67
10·41	...	·69	...	·76
7·67	...	2·84	...	·49
6·87	...	2·00	...	·57
8·95	...	2·30	..	·67
9·22	...	2·98	...	·61
5·43	...	2·48	...	·45
9·21	...	2·07	...	·59
6·34	...	2·30	...	·44
7·96	...	2·91	...	·53
8·48	...	1·70	...	·65
9·17	...	3·36	...	·63
9·18	...	4·78	...	·67
169·08	...	49·17		
Average 8·45	...	2·45		

1874. January 19. 2nd 20 after some heavy fines.

S. n. F.		Fat.		Ash.
8·19	...	2·35	...	·64
9·93	...	·62	...	·71
8·97	...	2·81	...	·56
9·50	...	2·26	..	·61
9·12	...	3·16	...	·67
9·18	...	3·77	...	·64
9·89	...	2·50	...	·68
9·03	...	1·07	...	·62
9·28	...	2·06	...	·63
7·99	...	·37	...	·67
10·37	...	1·92	...	·70
9·22	...	2·22	...	·71
10·42	...	2·58	...	·82
10·15	...	1·53	...	·68
10·35	...	2·62	...	·76
9·64	...	2·77	...	·77
8·96	...	2·79	...	·71
10·63	...	2·04	...	·70
9·49	...	2·62	...	·66
9·86	...	3·05	...	·73
190·17	...	45·11		
Average 9·50	...	2·25		

20 Samples of Milk submitted from Dec. 6, 1875, to Jan. 6, 1876.

S. n. F.		Fat.
9·43	...	3·19
10·29	...	3·80
9·61	...	4·20
9·36	...	3·54
9·09	...	1·33
9·66	...	2·56
9·56	...	3·49
9·61	...	3·21
9·19	...	2·80
8·92	...	1·95
8·86	...	3·13
9·63	...	2·78
7·86	...	3·27
9·60	...	4·29
9·09	...	3·31
8·47	...	3·27
9·33	...	5·02
9·26	...	3·68
9·27	...	3·31
9·08	...	5·72
185·17		67·85
Average 9·25		3·39

6 Milks submitted on the 10th February, 1876.

S. n. F.		Fat.
9·60	...	2·99
9·72	...	2·99
*7·96	...	2·57
9·00	...	3·58
9·37	...	2·77
*8·15	...	3·50

5 Milks submitted 12th February, 1876.

9·41	...	3·24
9·55	...	2·35
9·35	...	2·88
9·85	...	3·14
9·29	...	2·98

*The Two Samples in question.

[OVER.

ON THE HYPOPHOSPHITES.

Le Journal de Pharmacie et Chimie, for June, contains a paper of some length, on the character and impurities of the hypo-phosphites, by M. Patromillard, in which the author points out that owing to carelessness in their manufacture, the two most important hypophosphites, namely, those of lime and soda, are frequently contaminated to a considerable extent, the former with phosphates, phosphides, and barium, the latter with phosphates, sulphates, and barium, the phosphates which are produced by oxidation of the hypophosphites during evaporation, are rarely absent from the lime salt, and are the cause of the turbidity usually produced on dissolving it in water. It is obvious that some of the above impurities, especially the phosphides and barium, may considerably modify the action of these important medicines, and should the amount of impurity be excessive, their poisonous properties might render them extremely dangerous.

H. D'A. P.

MODIFICATION OF DUFLOS' METHOD FOR THE SEPARATION OF IODINE.

By C. Rice.

New Remedies for April.

Duflos' process depends upon the fact that ferric chloride in contact with metallic iodides or hydriodic acid liberates iodine, thus: $Fe_2Cl_6 + 2\,HI = 2\,Fe\,Cl_2 + 2H\,Cl + 2\,I$. The iodide is usually put into a distillatory apparatus, and the iodine passing over is received into a solution of iodide of potassium. The author's modification is to assist the evolution of the iodine vapours by a current of carbonic anhydride.

A. W. B.

CORRESPONDENCE.

TO THE EDITOR OF THE ANALYST.

Sir,—Having been obliged to leave immediately after the reading of Dr. Hill's paper on Milk of Sulphur at the last meeting of the Society of Public Analysts, I was unable to make any remarks on the subject, I shall therefore feel obliged if you will give me space for a few words.

I shall say little on the question of whether or not sulphate of lime increases or diminishes the effects of sulphur. Much must depend on whether it gets into solution in the stomach. If it does so, I believe the effects of sulphate of lime in solution in producing congestion of the liver are two well known to need comment, if it does not, the best that can be said for introducing a large quantity of an inert and gritty powder into the stomach and bowels is, that it *may* do no harm. As analysts we have nothing to do with this, the whole question for us being, is milk of sulphur a mixture of sulphur and sulphate of lime, or is it synonymous with precipitated sulphur. If we go by the only Pharmacopœia in which directions are given for making milk of sulphur, we must come to the conclusion that it may be either the one or the other, unless we conclude that the compilers of the work were not aware that sulphuric acid would precipitate lime, which I think much more probable, than that they should mean two things by the same word. This probability is increased by the fact, that in the next Pharmacopœa, that of 1746, the use of sulphuric acid disappears, but unfortunately, so does the name lac sulphuris.

THE ANALYST.

BUTTER ANALYSIS IN SCOTLAND.

From the Report of a Scotch prosecution for selling adulterated butter, which we print in another column, it would appear that butter analysis is but little understood at the Andersonian University. Some years ago the then Professor of Chemistry came to grief on an analysis of butter, and now his successor, Dr. Dittmar has failed even more lamentably, in conjunction with Dr. Stevenson Macadam, of Edinburgh. As we believe neither of these gentlemen holds the position of a Public Analyst, we shall be spared the usual outcry about the imbecility or incompetence of Public Analysts. Drs. Macadam and Dittmar are reported to have stated that they had examined the sample in question both by Bell's and Muter's processes, and also by the "old system," and finding the butter good according to the latter, which they thought was the most reliable one, they pronounced it pure. We have no doubt that all adulterators will hail with delight this return to "old systems," but, that two gentlemen with some knowledge of Chemistry, should have been found deliberately to prefer old and utterly worthless methods is more than we should have thought possible. Everyone with the slightest knowledge of the subject must have known that, up to the last few years, there was no system according to which butter fat could safely be distinguished from other animal fats, and, as a matter of fact, no chemist, who had any regard for his reputation, ventured to affirm the contrary. During the last two years, however, thanks mainly to the initiative taken by Messrs. Hehner and Angell, the subject of butter has been much worked at, and its analysis is now as well understood and as certain, as any other process in the whole range of food analysis. We do not blame Drs. Macadam and Dittmar for being ignorant of this, as the subject probably lies outside their usual pursuits, but we do blame them for being ignorant of their ignorance, and for venturing to give evidence in a court of law on a subject with which they were so imperfectly acquainted. Taking the evidence of both sides there cannot be the slightest doubt that the sample in question consisted mainly of fat other than butter. We trust that this case may serve as a warning to the Analysts of Scotland, and that when next we have to report a case of butter adulteration we may find that an intelligent knowledge of the processes for the analysis of butter is possessed by the Chemists engaged, whether they are employed for the prosecution or the defence.

ON THE DETECTION AND QUANTITATIVE DETERMINATION OF FREE SULPHURIC AND HYDROCHLORIC ACIDS IN VINEGAR, LIME AND LEMON JUICES, AND SIMILAR LIQUIDS.

By Otto Hehner.

Although a large number of methods for the detection and determination of free mineral acids in vinegar have been proposed, yet there is none, as far as I am aware, which could be considered to fulfil all the requirements expected from such a method. These requirements are, first, that a simple quantitative test should at once answer the question, whether a given sample of vinegar contains free mineral acids or not, so that, the result being negative, no quantitative determination need be resorted to; second, that the method for determining the amount of free mineral acid present should be exact within a few hundredths of a per centage; and third, that no substance or re-agent should be required which is not within reach of every chemist, and which is not to be found in the [illegible]ratory of any Public Analyst.

MILK STANDARDS.

[To the Editor of the "Analyst."]

Sir,—In your last number is a report of a paper on milk standards, read by Dr. Hill, before the Society of Public Analysts, in which he falls foul on myself, Dr. Redwood, Voelcker, and Messrs. Bell, Bannister, and Lewin, the chemists at Somerset House, in reference to the late milk prosecution at Coventry.

Now leaving the above-named chemists to defend themselves, I beg to state that Dr. Hill told the magistrates he had had six cows milked in his presence, in the month of June, and having taken the average of the fat of the six milks, he had come to the conclusion that if there was less than 3 per cent. of fat in a milk, the cream had been abstracted, and as he found but 2·47 in the suspected milk, he was of opinion that cream had been taken from it.

I, on the other hand as chemist for the defence, told the magistrates that there can be no standard of fat, unless the age of the calf, the time of the year, and the nature of the food are taken into consideration, in proof of which I produced my analysis book, in which I shewed analyses of undoubtedly genuine milk, in which I found less fat than what I found in the suspected milk, which was "fat 2·6."

One of the magistrate then asked me if I had ever seen the cows milked, whose milk I had aftewards analysed, I said I had not, but that all my samples had been "legally certified."

An adjournment was then agreed upon to give time to have the milk examined at Somerset House, and as the magistrates seemed to attach great importance to the chemist seeing the cows milked before his own eyes, I, on the following Saturday, March the 25th, met the farmer at the Coventry Station, who drove me in his trap to the farm, about four miles off.

I remember it was a bitterly cold day, and the country looked bare and desolate, there being hardly any grass to be seen, we arrived at the farm about 4 p.m., and found that the cows had just been driven home to be milked.

Four of the cows were then milked before me, and I took samples of each of the milks, which I put into four bottles, these I brought home for examination, and here give the results.

No. 1—Water	88·84	No. 2—Water	88.4
Butter	1·83	Butter	3·6
Caseine and Sugar of Milk	9·33	Caseine and Sugar of Milk	8·0
	100·00		100·0
No. 3—Water	89·07	No. 4—Water	86·70
Butter	1·59	Butter	3·44
Caseine and Sugar of Milk	9·34	Caseine and Sugar of Milk	9·86
	100·00		100·00

No. 1.—Butter	1·83
No. 2.—Butter	3·60
No. 3.—Butter	1.59
No. 4.—Butter	3·44
Divide by 4	10·46
Average of the four Butters ...	2·61—$_2$

It will be seen by the above, that the average of the Butters is 2.61, and as I found 2·6 in the suspected milk which came from the same farm, I could have no difficulty in coming to the conclusion that the cream had not been abstracted from the milk, and the magistrates were of my opinion, for they dismissed the summons with costs against the Coventry Corporation, and as Dr. Hill, in his certificate, had charged the unfortunate farmer with "fraud," they gave him a written certificate that he left the Court without a stain on his character.—Yours, &c.,

Birmingham, June 17th. ALFRED BIRD, F.C.S.

Mr. Bird omits to state whether the cows which he saw milked were milked "dry," and what time had elapsed between their being last milked, and the milking which he witnessed.

These points are important.

As vinegar consists, except in the case of its being distilled, not merely of acetic acid and water, but always contains potash and soda salts of organic acids, as the tartrate or acetate, and chloride of soduim, it is obvious that sulphuric or hydrochloric acids, if added in small quantity, can no longer be considered to exist *as such* in vinegar, but that they decompose an equivalent quantity of acetate or tartrate. Whenever there is any undecomposed acetate or tartrate present in vinegar, no trace of any mineral acid can be present in the free state. As the organic salts of the alkalies are converted by incineration into the corresponding carbonates, it can safely be asserted. *Whenever the ash of a vinegar exhibits an alkaline re action, free mineral acid cannot be present in the vinegar.* Mineral acid may have been *added*, but it then has become neutralised by the decomposition of the acetates or tartrates. We have thus the simplest possible qualitative test for free mineral acids in vinegar.

But whenever the ash is neutral, free mineral acid is most likely present. The quantity of this may be ascertained with the utmost accuracy by following the same principle. If we add to a measured quantity of the suspected vinegar, a known and exactly measured volume of decinormal soda solution, somewhat more than would be necessary to neutralise the total amount of free mineral acid present, evaporate and incinerate, the alkalinity of the ash gives the measure of the quantity of the free sulphuric or hydrochloric acid. Supposing we add 20c.c. of standard alkali to a vinegar, and find after incineration, by titration with standard acid, an alkalinity corresponding only to 5c.c., then 15c.c. of the soda solution have been neutralised by the mineral acid in the vinegar.

As the point of neutralisation can be far easier ascertained, litmus being used as an indicator, by titrating from red to blue, than from blue to red, and as the latter plan offers several other advantages, it is advisable to operate as follows:—A measured quantity, say 50 cc. of the vinegar to be examined, is mixed with 25 cc. of decinormal soda solution (capable of neutralizing 0·200 per cent. of SO_3). The liquid is evaporated on the waterbath in a platinum basin, the residue is dried to prevent spirting in the air, or on the sand-bath at about 110°C, and is then carefully incinerated at the lowest possible temperature. The ash need not be burned white. 25cc. of a decinormal sulphuric acid solution, corresponding exactly to the soda solution, are now added to the ash, the liquid is heated to expel all carbonic acid, and is then filtered into a small beaker. The filter is washed with hot water, tincture of litmus is added to the filtrate, the acidity of which is ascertained by means of the decinormal soda solution. *The volume of soda necessary for neutralisation directly gives the proportion of free mineral acid present in the vinegar*, 100 cc. of the standard solution, corresponding to 0·49 grammes of $H_2 SO_4$.

It may happen, when more than 0·200 per cent. of free mineral acid is present, that the 25 cc. of decinormal solution added to the vinegar are insufficient to neutralise all free mineral acid: in that case 25 cc. of decinormal soda would be required to neutralise the filtrate. A fresh experiment, with the addition of a larger quantity of soda solution, say 35 or 40 cc. to the vinegar must then be made.

An error of one cc. of decinormal soda solution, would cause with 50 cc. of vinegar an error only in the amount of free mineral acid of 0·0098 per cent., calculated as $H_2 SO_4$, but practically results of far greater accuracy can be obtained, as the following experiments show. I will remark, that they are taken without selection, but were made with scrupulous care.

case is very different with the beam; here the number of vibrations in a given time augment in the ratio of the squares as the beam shortens, so that a beam one-third the length of another would perform nine vibrations to one vibration of the longer, while the loss of sensitiveness on that score only amounts to one-third. We can, therefore, by using such short beams, afford to restore the requisite sensitiveness by lessening the distance between the points of gravity and suspension, and still retain to a great degree the advantage of quick action. Another consideration of importance in this respect is the extreme lightness of the beam as compared with the long one. The friction being much less, this would also cause a greater freedom of action, and tend to accelerate the vibrations.

The capabilities of this balance are such that it yields to the tenth part of a milligramme with the greatest precision, and has a working range up to one thousand grammes.

The appliance by which it is worked will be found extremely convenient. When not in use, all the knife edges are disengaged. By turning the handle, which is visible in the figure opposite, all the acting parts come into play one after the other. The whole range of motion of the handle is about one-half of a turn. Beginning the operation, the pans are freed first; they are easily brought to rest by gently bringing their stoppers in contact with them by carefully turning the handle back again once, or twice if necessary. When they are perfectly quiescent, the further turning of the handle engages the suspension pieces by gently and simultaneously bringing their knife edges in contact with their supports; the end of the handle motion suspends the beam, and the balance is ready for use. After use the handle is turned back again, by which everything is set out of action. This arrangement, besides the great convenience it affords, prevents all unnecessary wear of the acting parts.

In order to enable the final operation to be performed in the perfectly closed case, a parallel action and sliding rod serves to lift the rider and place it in the required position with the greatest ease. The rider can be used the whole length of the beam.

To ensure greater strength the whole is fixed to a stout glass plate which is supplied with two spirit levels. The Balance is so arranged that it can easily be taken to pieces and put together again. The pieces, when apart, fit in a box, and can be carried about without any fear of injury in the transport. The knife edges and their supports are made of agate, and most carefully finished.

The form I have adopted for the smaller weights from 0·5 downwards will also be found very convenient. They are made of wire, turned up into a flat spiral, the inner end projecting and forming a little upright by which it can easily be taken hold of. The number of coils indicates the number of units in each decimal, and the decimals themselves are distinguished by different thicknesses of the wire.

An inspection of this Balance is respectfully solicited at my office, **55, Upper Marylebone Street, Portland Place, London, W.**

O. WOLTERS,
(Many years with L. Oertling,)
Manufacturer of Weights, Chemical, Assay and Bullion Balances.

2. *Elderberries (sucambucos niger)*, the juice of which becomes wine red by fermentation or by the action of acids, much used in north and central France, Portugal, and Spain. Its tone is heightened with tartaric acid, but more frequently with alum. Sometimes the berries of the dwarf elder *(sucambucos ebulus)* are employed. The juices of both these Elders are purgative in moderate doses.
3. *Privet Berries (Ligustrum vulgare)* impart a crimson tint when recently added, or after fermentation, but if the juice is fermented the colour is that of an old red wine. Not much employed in France.
4. *Portugal Berries (Phytolacca decandra).*—Their use is now almost abandoned, because the juice contains a drastic purgative.
5. *Whortle Berries.*—Chiefly used in Paris, or in Switzerland to colour white wines, but not in the wine growing districts.
6. Decoction of beet root; seldom used alone, it being generally employed to mask the tints of cochineal, and of fuchsine.
7. *Logwood.*—There are several varieties, one of which gives reactions closely resembling Brazil wood. Chiefly used in Paris for common wines. When added to new wines it imparts to them an appearance of age.
8. *Brazil Wood* (alcoholic extract of).—Used for same purposes as logwood, but not employed in the producing districts.
9. *Cochineal*, (carmine, carmine lake, ammoniacal carmine.)—Very largely employed, chiefly in central France to raise the tone of wines, which are in turn themseves frequently used to adulterate the wines of Burgundy and Bordeaux. It is usually sold in thick solution in ammonia, or in cakes made by wetting the cochineal with ammonia and then pressing it.
10. *Fuchsine, aniline reds and violets*, not unfrequently contaminated with arsenic, are used in large quantities either alone or mixed with various other yellow or red substances to diminish the brilliancy of their tint.
11. *Grenat.*—A bye product in the manufacture of Fuchsine, (a few years ago valueless, but now sold at a remunerative price in consequence of its use for the adulteration of wines.) It consists of a mixture of mauve aniline, crysotoluidine, fuchsine, and an undetermined body called brown grenat.
12. *Indigo-carmine* or ceruleine, in paste, added to common wines deepens their colour, and renders them purple or violet. Tolerably largely used in Central France.
13. A few substances are sold under fantastic names, such as "colourine," "caramel," "colouring fluid," &c., consisting of fuchsine residues, mixed with beetroot extract, carmine, &c., &c.

The order of the importance of the colouring matters most frequently employed, is as follows:—1. Fuchsine. 2. Cochineal. 3. Hollyhock. 4. Elder. 5. Indigo.

The greater part of the colouring matters communicate a rose, red, or rich violet tint to the wines, which frequently is fugitive, and in the wines thus tinted the foreign colouring matters soon separate and carry with them a portion of the natural colouring matters; this is specially noticeable when cochineal, indigo, or fuchsine are the adulterants.

REACTIONS CHARACTERISTIC OF THE NATURAL COLOURS OF WINES.

There are slight variations in the reactions with the products of different vines, and particularly with the age of the wine. The following apply to wines of Central France, more especially of Bourgogne, and of the Gironde, examined as they are usually sold, about five to eighteen months after the vintage, when they are said to be *made*, but not *aged*.

*Carbonates of Soda.**—A very dilute solution of di-sodium carbonate affords a means of recognizing certain adulterations. Thus elder (wall wort), dwarf elder, privet and hollyhock change to green or grey blue; whortle berry, Portugal berry, and beetroot retain their colour; among those which change to green with the neutral carbonate of soda, hollyhock undergoes the same change with bicarbonate while both elders are unchanged, 5 c.c. of a 1-200 solution of di-sodium carbonate, added to 1 c.c. of natural wine afford a greenish-grey, green, or bluish-green colour, depending upon the age and variety of wine. In certain sorts, a winey or lilac tint remains; *teinturier* affords a deep bluish-green tint, which becomes chestnut brown on heating.

All the following reactions were performed on the wines clarified by a process to be shown further on; or else diluted with five to ten times their volume of water, so that the colours were reduced to a mere rosy tint.

The changes of colour should be observed about two minutes after the addition of the re-agents.

Sodium Bicarbonate, charged with carbonic acid—(Eight per cent. by weight solution,) Equal volumes of wine, and of this re-agent afford a slightly cloudy iron-grey liquid, with tint of bottle green. *Teinturier* becomes deep green; *aramon* rose winey brown; *aramon with petit Bouschet* lilac changing at 100° to the colour of extract of tea.

Borax.—Saturated solution at 15°. One volume of wine with two volumes of this re-agent becomes bluish-grey, or that colour with greenish tinge (*pinot* 16 months old; *carignane* 5 months); greenish (*carignane*) or greyish-blue with feeble violet tinge (*carignane*, 18 months old); or entirely wine-lilac, (*aramon* alone, or with *petit Bouschet*.) The colours should be viewed by transmitted light reflected from a white surface; they last unchanged for several hours.

Ammonia.—Ten volumes of ordinary ammonia with 90 of water. The deeply coloured wines of Central France, mixed with an equal volume of dilute ammonia, change to greenish grey, bottle green, greenish-yellow, or grey greenish blue. With *aramon* (of which the colouring matter differs most from that of the generality of wines,) or with mixtures containing it, the change is to buff, or decoction of tea with trace of lilac. With new wines the colour is more decidely green, but changes subsequently to brown; with those over a year old the colour is that of a dead leaf, if the wine is very dark coloured (like Roussillon), and the grape had become perfectly ripened, a single drop of a stronger ammonia causes a blue colouration or precipitate; then the colour changes as before mentioned to greenish or brown.

Sulphide of Ammonium.—8 c.c. of ordinary ammonium sulphide, with 10 c.c. of ammonia, made up to 1 litre, with water. Equal volumes of the wine, and the re-agent are mixed and filtered. The filtrate is greenish with pure wines, but bluish or violet-lilac with those adulterated. The re-action is not satisfactory.

* In the preparation of the re-agents, the directions given must be followed strictly to the letter in order to avoid errors otherwise inevitable.

Baryta Water.—Saturated solution. Equal volumes of this reagent and clarified or diluted wine afford on filtration an olive green, or dirty greenish yellow filtrate, sherry coloured with *teinturier*, old brandy coloured with *aramon* of 18 months. This filtrate becomes rose on acidification with acetic acid, except with *teinturier*, which remains buff, and *aramon* which becomes clear yellowish green. It becomes red-brown, or yellow-brown with logwood, or Brazil wood.

Subacetate of lead.—2 c c of wine with 1 c.c. of solution of subacetate of lead, of 15° B give a coloured precipitate from which no indication of the nature of the colouring matter can be obtained. When filtered the filtrate is colourless with wine, and most vegetable colouring matters; but rose or lilac with Brazil wood; pale rose with fuchsine.

Sulphurous acid.—It has been stated by various authors that any wine, the colouring matter of which was not destroyed by this re-agent might be considered to be adulterated, but in fact, whereas many vegetable colouring matters are so destroyed, that of wine remains unaffected even after 24 hours.

Nascent Hydrogen (by the action of hydrochloric acid on zinc), affords no satisfactory reaction.

Barium Peroxide.—3 c.c. of clarified or diluted wine acidified with five drops of a 5 per cent. solution of tartaric acid, and treated with 0·1 grammes of barium peroxide is nearly discoloured in 24 hours. With elder (both varieties) fuchsine, Brazil wood, logwood, beetroot, and cochineal, the colour remains for a very much longer time.

REACTIONS FOR DISTINGUISHING MIXTURES OF WINE AND COLOURING MATTERS.

The first portion of this section is devoted to a review of the various methods that have been suggested for detecting the foreign colouring matters in wines. Having examined them all, the author avers that they are valueless. Among them are the process of Fauré (who suggested the precipitation of the natural colouring matter in wine, with tannin, and examining the filtrate therefrom for the artificial ones,) and of Dr. Facon (decolourisation of the wine by manganese peroxide.)

A tolerably successful method is to put into the suspected wine skeins of silk or wool variously mordanted with such mordants as alum with cream of tartar, oxychloride of tin, and acetate of alumina. Certain differentiating characteristics were thus obtained, but the method cannot be generalized; yet by mordanting scoured silk with tartaric acid, fixing the colour and drying it at 100°, after having acted upon it with various reagents, such as ammonia, lime-water, chlorides of zinc, iron, calcium, salts of copper and tin, some new re-actions were observed, which are characteristic of certain colouring matters.

[*To be continued.*] C.H.P.

THE LATEST CHEMICAL DISCOVERY.

THE *Chemical News*, of the 18th inst., startles us with the wonderful announcement that "an establishment has been opened in Belgium for extracting "*the wool from grease*, (we think this chemical curiosity justifies the italics, which are our own), and that the "yield" of wool "is understood to be large." We regret that the exact details of the process are not given as they would doubtless be interesting, but possibly the method resembles in some degree that used for the extraction of sunbeams from cucumbers.

The marvels of Science certainly appear to be illimitable.

REVIEWS OF BOOKS, &c.

The Analyst's Annual Note Book, 1875, edited by S. W. Rich.*

This little manual contains in a portable form a number of collected articles on the analysis of a variety of substances, and, while it may be of use for reference to chemists in general, it will be found of most value to those who have not the time or the opportunity for consulting Chemical Journals as they are published.

It is, of course, only a compilation of papers which have already been published, but it contains much valuable information on the analysis of such substances as bread, butter, milk, tea, citric acid, water, wine, &c.

While appreciating the discriminating care with which Mr. Rich has made his selection, we cannot but express our regret that his regard for the ethics of journalism has not suggested to him the propriety of stating in each case the source to which he is indebted for the article he publishes, and also of indicating in which instances (if in any) an article is reproduced in its entirety, and in which it is merely an arbitrary abstract.

We will explain what we mean by an example or two.

More than six pages are devoted to a paper by professor Wanklyn, on the "Detection of Alum in Bread."

No intimation is given that this is merely an abstract, and no acknowledgment is made of the fact that these six pages are "cribbed" from the published volume of "The Proceedings of the Society of Public Analysts." We must refer those who wish to read the whole of the paper to that volume.

Precisely the same remark applies to a paper. "On taking the melting point of Butter, by Dr. Tripe, which is taken from the same source without any acknowledgment, and cut down at the will of the compiler.

A very valuable paper on Butter Analysis by Mr. Angell, is treated in the same way—emasculated, and inserted with no acknowledgment of the source from which it is taken.

A paper by Mr. W. C. Young, on the Volumetric estimation of Chlorides in the presence of Alkaline Phosphates, is treated with the same unfairness, as also is a paper by Dr. Redwood, on "The Analysis of Milk," one by Dr. Stevenson, on "The decomposition of Milk," one by Mr. Allen, on "The Adulteration of Tartaric and Citric Acids," as well as Mr. Wigner's exhaustive paper on "Tea," and Dr. Dupré's valuable essay on "The Natural Constituents of Wine."

The only thing that can be said in palliation of this wholesale system of appropriation, is that our compiler has been fairly unfair all round.

To amateur chemists and those only desiring to obtain a smattering of the subjects treated of, this book will be useful.

To the numerous chemists who posses the "Proceedings of The Society of Public Analysts," it will appear to a great extent a *rechauffé* of that work, and to those chemists who, not having already read the papers in question, have a wish to study them with a view to actual manipulation, we need hardly point out the wisdom of their possessing themselves of the papers in their entirety, with the discussions which in most cases ensued.

We wish this little compilation all the success it deserves; but we would suggest to Mr. Rich, that he would be no loser, and his readers would be gainers, if in his next issue he were to frankly acknowledge to what sources he is indebted for his articles, and, where they are abstractions, if he would mention the fact, and state by whom they have been abstracted. Chemists would then know what value to attach to the abstractions as faithfully representing the views of the respective authors.

*Butler & Tanner, Frome.

CORRESPONDENCE.

To the Editor of the "Analyst."

Sir,—Will you allow me space for a few words in answer to some of the remarks made during the discussion on my paper on Butter Fat, read before the Society of Public Analysts, on June 14th, and which appears in the last number of "The Analyst."

I believe every one is now convinced that a high specific gravity, taken by itself, is no proof of the purity of any given sample of butter.

I entirely dissent from Dr. Muter's historical sketch. What may or may not have been done in the privacy of laboratories we know not. We must, therefore, confine ourselves to published records. Here we have firstly Messrs. Hehner and Angell's pamphlet on butter, which is undoubtedly the foundation of our present butter analyses, secondly my note confirming the main features of Messrs. Hehner and Angell's work, read before the Society of Public Analysts in January, 1876. Thirdly, Dr. Muter's papers read March 15th, 1876, which, like my own previous note, is essentially nothing more than a confirmation of Messrs. Hehner and Angell's statement; and lastly my paper of June 14th. The experimental demonstration of the fact that butter fat really does contain a notable proportion of soluble fatty acids is the main point; the methods by means of which this is ascertained have but of secondary importance. Next I look upon Dr. Muter's method for the estimation of the soluble fatty acids as greatly inferior to either of the three described in my paper, and also as more complicated than the one finally adopted. It will be recollected that Dr. Muter arrives at the proportion of soluble acids by means of three distinct estimations, each differing from the others in principle. First, the total free acid is estimated in $^1/_5$ of the bulk by standard alkali. Secondly, the total amount of sulphuric acid is estimated in $^1/_{10}$ of the bulk by precipitation with barium chloride. Thirdly, the total combined sulphuric acid is determined in $^1/_{10}$ of the bulk, by evaporation and final ignition of the residue, which residue is taken as potassium sulphate. Assuming that no mistake is made in the various measurements, the following may, I think, be looked upon as reasonable experimental errors. First, variations in the amount of alkali necessary to neutralize the 200 cub. cents. will not be less than 0·1 cub. cent., equal to 0·5 cub. cent. on the litre, corresponding with the alkali used by Dr. Muter, to 0·026 grams butyric acid. Secondly, any one strictly following Dr. Muter's directions, will have worked well if he comes within 1 per cent. of the total amount of sulphuric acid present, equivalent (taking the one experiment given in full by Dr. Muter as basis) to 0·088 grams butyric acid. Thirdly, few will come to within 1 per cent. of the true amount of combined sulphuric acid present by following Dr. Muter's directions, in which no allowance is made for any impurity in the potassium hydrate employed, which is never absolutely pure, and, worse still, no account is taken of the fact that on ignition of the dry residue obtained by evaporation, much carbon is separated which has to be burnt off and reduces some sulphate to sulphide. Now 1 per cent. on the combined sulphuric acid is equivalent to 0·07 grammes of butyric acid. The sum of these errors, which I am sure have not been exaggerated, is 0·184 grams of butyric acid, equal to 1·814 per cent. on the 10 grammes butter fat taken.

What now is the probable error to which the process of titration is liable? In this the total amount of soluble acid is estimated by means of a process which involves the measurement of 25 cub. cent. normal soda, of 25 cub. cent. of acid,

slightly above the normal, and the volumetric estimation of the excess of acid present in the mixture by means of deci-normal soda. Any one of average skill will be able to do this and come always within 0·2 of decinormal soda, but let us assume that the variation amounts to 0·5 cub. cent.*

0·5 cub. cent. deci-normal soda are equivalent to 0·044 grammes of butyric acid, which, on 5 grammes, correspond to 0·088, or say 0·1 per cent., which may be taken as the maximum error to which, in moderately skilful hands, this method is liable, for the process of saponification &c., &c., does not increase the error of titration. If two successive estimations of soluble acid in a sample of butter differ by more than this, the error is due, I am convinced, not to a mistake in the estimation of the soluble acid actually present in the washings, but to the fact that more soluble acid has been washed out in the one case than in the other.

It may fairly be asked how, if the method employed by Dr. Muter is so faulty, I explain the marvellous correspondence between the duplicate analyses of the same butter fat given in Dr. Muter's paper. I can only answer, I cannot explain it, unless it be accidental, for even at its best Dr. Muter's process is necessarily less accurate than the process of titration, as it involves three estimations (instead of one), each of which is liable to error, which, whatever it may be, has to be multiplied by 5 or 10. I look upon the fact mentioned by Dr. Muter, viz.: that the sum of acids (calculating the soluble acid as butyric acid) in my analyses rarely comes up to 94 per cent., whereas in his case it comes up to nearly 95, in spite of the fact that he saponified in an open vessel and thus lost about ½ per cent. of soluble acid, as a strong proof that my process is more correct than his.

In conclusion I would remark that I began my experiments on the saponification with standard alkali in the Autumn of 1875, that in my communication to the Society of Public Analysts, in January of this year, I stated that I had made experiments in that direction, and was then engaged in similar experiments, which I hoped would be more accurate than the former, as well as more easy of execution. This meeting took place two months before the reading of Dr. Muter's paper. The method is, in fact, nothing more than an application of Berthelot's well known process for the titration of ethers, with which I have worked for ten years or more.

Yours, &c.,

A. DUPRÉ.

MILK OF SULPHUR.

To the Editor of the "Analyst."

Sir,—Referring to Dr. Hill's "Paper" on Milk of Sulphur, which he read before the Society of Public Analysts, as reported in your last number, I gather from it, that Dr. Hill's contention is, that when he wants to buy the sulphur precipitatum of the British Pharmacopœia of 1867, he, as a medical man, is at liberty to ask for it, either by the name of precipitated sulphur, or by the name of milk of sulphur.

In reply to this, I desire to point out that though the two names in former Pharmacopœias may have synonymously applied to the precipitate thrown down by sulphuric acid, and to that thrown down by hydrochloric acid, the British Pharmacopœia of 1867 plainly and clearly shews that the hydrochloric acid preparation *alone* shall be called by the name of precipitated sulphur.

* 0·5 cub. cent. of deci-normal soda is equal to 0·05 cub. cent. normal soda, which is about 1 drop, and according to Dr. Muter, would when calculated to per centage of butyric acid give an enormous error.

Dr. Hill therefore, as a medical man, is not at liberty to embarrass the retailer by asking for milk of sulphur, if he wants precipitated sulphur, and there can be no question that he is pharmaceutically reprimanded if he does so, in proof of which I give the following extract from the preface of the British Pharmacopœia of 1867.

"By the Medical Act of 1858, section 54, it is enacted that the General Council shall cause to be published under their direction a book containing a list of medicines and compounds. And by a subsequent Act, the 25th and 26th Vic., cap. 91, recites that different pharmacopœias having been published in England, Scotland, and Ireland, the pharmacopœia to be published is intended to supersede the above mentioned pharmacopœias. The present work, therefore, is produced in compliance with and under the sanction and authority of these Acts of Parliament, and is intended to afford to the medical profession, and those engaged in the preparation of medicines throughout the British Empire, one uniform standard and guide, whereby the nature and composition of substances to be used in medicine may be ascertained and determined.

It will be seen by the above "extract," that all former Pharmacopœias, including of course the names of all drugs, and all processes for the compounding of medicines, have been superseded, and that the ONE CODEX for the making, dispensing, and prescribing of medicines is the British Pharmacopœia of 1867, in order that prescribers and dispensers may mutually understand each other.

A grave responsibility therefore rested upon Dr. Hill, in flatly disobeying his pharmacopœia when he told his man to ask for precipitated sulphur by a name which is not in that work, and he, is the wrong doer, and not the unfortunate retailer, who, when he was asked for milk of sulphur, sold milk of sulphur.

Dr. Hill seems to exult, that when his man went round to the chemists' shops to ask for milk of sulphur, out of thirteen purchases, ten of the retailers gave for it the precipitated sulphur, thrown down by hydrochloric acid, and the wonder is, the whole thirteen did not sell that preparation after receiving a certain circular, of which the following is a copy.

SPECIAL NOTICE.

"As the Borough Analyst is obtaining samples of milk of sulphur from chemists and druggists in Birmingham and district, it is desirable to save annoyance that only the pure precipitated sulphur should be supplied."

This curious circular was sent to all the chemists by an influential firm, and it appeared to me in plain English to mean, "When the Borough Analyst's man asks for an article, *take his money*, but to save annoyance, give him something else!"

Yours, &c.,

BIRMINGHAM, ALFRED BIRD, F.C.S.

July 26th, 1876.

(The above letter reached us too late for publication in our last issue, but the subject being of interest to Chemists in general, we insert it now.)

VOLUMETRIC DETERMINATION OF PHENOL.

By W. F. KOPPESCHAAR.

Zeitschr: F. Anal. Chemie, III., 1876.

ON the addition of an aqueous solution of bromine to liquids containing Phenol, a precipitate is thrown down, consisting of Tribromophenol. According to Landolt, this precipitation is still perceptible in a solution containing, 1 part of Phenol in 43,700 parts of water; and accordingly this substance possesses a high degree of insolubility. Experiments have proved, that the action of Bromine upon Phenol takes place according to the formula $C_6\ H_6\ O + 6\,Br. = C_6\ H_3\ Br_3\ O + 3\,H\ Br.$ But on account of the difficulty of collecting, washing, and drying this precipitate, a direct gravimetrical determination of the phenol cannot thus be accomplished, the tribromophenol being very voluminous and volatile at 100° C.

But according to the numerous experiments of the author, Phenol may be determined with great accuracy, volumetrically, by ascertaining indirectly the quantity of Bromine which combines with a known quantity of the substance to be examined. He prepares an aqueous solution of bromine, and determines its strength by titrating, by means of hyposulphite of soda, the iodine separated from iodide of potassium, by a measured volume of the bromine solution.

A clear solution of the sample to be analysed, is prepared by dissolving 4 grammes in 1000 cc. of water, the liquid being filtered, if necessary 25 cc. of this solution are put into a stoppered bottle, capable of holding 500 cc. A measured volume of the bromine solution, containing more bromine than is necessary to effect the reaction is added, and the liquid is allowed to rest for about a quarter of an hour. Iodide of potassium is now added, and the iodine is determined as usual by means of hyposulphite of soda. Thus the necessary data are obtained to calculate the percentage of $C_6 H_6 O$ in the sample.

As it is both inconvenient and somewhat inaccurate to operate with Bromine water, a slight loss by evaporation being hardly avoidable, the author made a series of observations, employing the mixture of bromide and bromate of potassium, obtained by saturating caustic potash with bromine, and liberating from this mixture the bromine by means of hydrochloric acid. Thus the bromine acts in a nascent state. The results obtained in this manner are highly satisfactory. This latter modification is especially recommended when many samples of Phenol have to be examined.

O. H.

OFFENCES UNDER THE SALE OF FOOD AND DRUGS ACT.

Adulterated Butter in Glasgow.—Mr. M'Kinnon, Provision dealer, was charged under the Food and Drugs' Act, with having sold a pound of adulterated butter. The assistant sanitary inspector stated that he obtained the butter from M'Kinnon's shop, and that it had been analysed by Dr. Clark, one of the city analysts, who found that it was adulterated with extraneous fat to the extent of two-thirds of its weight. Dr. Clark, city analyst, stated that he made his analysis by Bell's and Muter's method, which he believed were correct. Dr. Stevenson Macadam, Edinburgh, stated that he had made an analysis of a sample of the butter by Muter's mode and by the old system of testing. By the former the butter appeared to be adulterated and according to the old system it was quite sound. He believed the old system was the correct one, and that the butter was quite good. Dr. Dittmar, Professor of Chemistry in the Andersonian University, gave similar evidence as the result of the two processes of analysis. He did not think Muter's system was the correct one, and was of opinion that the butter was quite sound. A portion of the sample was ordered to be sent to Somerset House, and on the adjourned hearing judgment was given. The Somerset House Analysis was as follows, water 14·30 per cent., curd and impurities 0·48 per cent., salt 3·81 per cent., and fats 81·41 per cent. The analysts add that they are of opinion that the sample is made up almost exclusively of a fat which is not that of butter, and which has apparently been worked up with a little milk. The defendant was fined two guineas, and the cost of the Somerset House Analysis.

Alum in Bread.—At the Wednesbury Police-court, John Hartill, was summoned for selling adulterated bread. Mr. Jones, the County analyst, stated that upon analysing the bread he found that alum had been used to enable defendant to use damaged flour, and to make a presentable loaf, and to prevent further decomposition of the gluten and other substances in the flour. Mr. Sheldon, in defence of the accused, said that his client was extremely sorry for what had occurred, and would take care that the offence was not repeated. The Stipendiary said that if defendant repeated the offence he would be liable to be sent to the assizes or the sessions. The defendant was fined £25 and costs.

Milk Adulteration.—William Mason, of Homerton, was summoned for selling adulterated milk, The inspector sent it to the parish analyst, and put in the certificate from that gentleman to the effect that the milk was adulterated with 20 per cent. of water. The defendant made a novel defence, viz., that he had during the hot weather to put ice into the milk to preserve it. Mr. Barstow said he could not take that excuse. Ice was well known to be congealed water. It was no excuse to a butcher if he sold stinking meat. He ordered the defendant to pay a fine of £5 and 2s. costs.

At the Brentford Petty Sessions, two dairymen, named Harris Thompson and Chas. Stanley, appeared to answer to adjourned summonses for unlawfully selling milk adulterated with water. In Thompson's case the milk in question, on being analysed by Dr. Redwood, was found to consist of 82 parts milk and 18 parts water. After further evidence the defendant was fined £7 including costs, the justices intimating that they were determined if possible to put a stop to such practices. The case of the other defendant was very similar, and after hearing the evidence, including that of Dr. Redwood, the justices, after consultation, imposed a fine of £5 including costs.

On May 26th, at Chesterfield County Police Court, Arthur Slater, druggist, of New Whittington, was summoned under section 6 of the Sale of Food and Drugs Act, for selling a which was not of the nature, substance, and quality demanded by the purchaser.

Lieutenant-Colonel Shortt, inspector for North Derbyshire, said that on May 9th he instructed his assistant to take a prescription to the defendant's shop and have it made up. At the same time he told him to ask for two ounces of "precipitated sulphur." He wrote down the name of the article in the assistant's note book so that there might be no mistake. He subsequently went into the shop and told the defendant that he intended to take them to the county analyst, Mr. A. H. Allen, of Sheffield. He offered to divide them into three parts, and this offer the defendant accepted. There was no label on the sulphur. He said "You sell this as 'precipitated sulphur' I suppose," and the defendant replied in the affirmative. He submitted the articles to the analyst, and subsequently received a certificate (produced) which stated that the sample did not consist of precipitated sulphur, but of orange sulphuretted antimony, which was a very active remedy, and if taken in quantity by mistake for precipitated sulphur would have had a dangerous and probably fatal effect.

Job Bayes, assistant-inspector, stated that he asked the defendant for "precipitated sulphur" as he had been instructed, and the defendant said, "Precipitated sulphur of antimony, I suppose you mean?" He replied, "I don't know; I was told to ask 'precipitated sulphur.'" He was certain he did not mention antimony; he had never heard of such a preparation. He read what Colonel Shortt had written for him.

In defence it was contended that the two preparations were totally dissimilar, and the defendant who had been a dispensing chemist for thirty years could not have made such a mistake, but the purchaser must have asked for the antimonial preparation.

Mr. Gabriel, surgeon, gave evidence in favour of the defendant, who, he said, dispensed many prescriptions for him, and he had always found him accurate. No druggist could make the ignorant mistake alleged. The magistrates considered the case proved, and inflicted a fine of £2 10s. and costs.

WESTMINSTER.—*Penalty for refusing to serve a Food Inspector.*—Edward Hunt, cheesemonger, of 200, Vauxhall bridge-road, was summoned for refusing to supply one of the sanitary inspectors of the Board of Works for the Westminster district, a certain article of food, to wit, butter.—It appeared from the evidence of Mr. Hughes that, in his official capacity, he went to the shop of the defendant, and was served with half a pound of butter at sixteen pence per pound. He told the defendant that he had purchased the butter for the purpose of analysis, whereupon the defendant snatched it from him, and said he could not afford to sell it at the price. Witness had purchased butter before at this shop at the same price, and found it genuine.—Defendant said there was a doubt on his part whether it was genuine or not and he had since discovered that it was genuine.—Mr. Arnold fined him £5, giving the alternative of a month's imprisonment.

GREENWICH.—George Francis Sillcott and Calvin Dennis Smith, tradesmen, carrying on business as grocers, appeared to summonses at the instance of the vestry authorities at Rotherithe, charging them with selling butter as an article of food, which, on analysis by Dr. Muter, was proved to have been adulterated to the extent of 25 per cent of foreign substance, but which was not injurious to health. The charges were proved by the inspector, the butter in question being purchased at the rate of 1s. 2d. per lb. Mr. Pook, who appeared for Smith, produced invoices received in payment of the butter, and said it was retailed as it was bought. The defendant Sillcott made a like defence. Mr. Patteson told the defendants that they should obtain warranties as to the genuineness of the butter they purchased from the vendors, and fined them 20s. and 2s. costs. The defendants said that such warranties, when asked for, were refused.

At the West Bromwich Police Court, on Saturday, before the Hon. A. G. Calthorpe, Major Williams, Mr. J. A. Kenrick, and Dr. Underhill, the charges against Mr. Gough and Mr. Leighton, milkdealers, of West Bromwich, for an alleged adulteration of milk, were again heard. The cases had been twice adjourned, on the first occasion for the samples of milk to be tested by the officials of the Inland Revenue Department, Somerset House, London, and on the second occasion for the chemical analysts from London to attend and be cross examined in respect of their certificates. The Government analysts, in their certificates, admitted that the samples were in an advanced state of decomposition, but made allowance for that in their results, which, in one case, showed that there were 8·14 per cent. of solids, not fat, 3·50 per cent of fat, and 88·36 per cent. of water. The analysts, in their report of this case, concluded as follows: "When the necessary allowance for the solids not fat lost by the decomposition of the milk has been made, the amount is lower than is present in samples of milk of first quality, but not less than is frequently found in genuine milk of low quality. The quantity of fat represents a milk of first quality, and exceeds the proportion found in many genuine milks. This, in our opinion, is an important part in judging as to the character of the sample. Under these circumstances, we do not feel justified in pronouncing the milk adulterated with water." In the other case, the chemists were unable to express a definite opinion as to whether the milk was adulterated with water. The certificates were signed by three of the Government analysts.—Mr. Young now appeared for the prosecution, which had been taken out at the instance of Mr. Horder, inspector under the Adulteration of Food Act, who was present, together with Mr. Jones, the county analyst, who had certified that the milk was adulterated. Both cases were dismissed.

case is very different with the beam; here the number of vibrations in a given time augment in the ratio of the squares as the beam shortens, so that a beam one-third the length of another would perform nine vibrations to one vibration of the longer, while the loss of sensitiveness on that score only amounts to one-third. We can, therefore, by using such short beams, afford to restore the requisite sensitiveness by lessening the distance between the points of gravity and suspension, and still retain to a great degree the advantage of quick action. Another consideration of importance in this respect is the extreme lightness of the beam as compared with the long one. The friction being much less, this would also cause a greater freedom of action, and tend to accelerate the vibrations.

The capabilities of this balance are such that it yields to the tenth part of a milligramme with the greatest precision, and has a working range up to one thousand grammes.

The appliance by which it is worked will be found extremely convenient. When not in use, all the knife edges are disengaged. By turning the handle, which is visible in the figure opposite, all the acting parts come into play one after the other. The whole range of motion of the handle is about one-half of a turn. Beginning the operation, the pans are freed first; they are easily brought to rest by gently bringing their stoppers in contact with them by carefully turning the handle back again once, or twice if necessary. When they are perfectly quiescent, the further turning of the handle engages the suspension pieces by gently and simultaneously bringing their knife edges in contact with their supports; the end of the handle motion suspends the beam, and the balance is ready for use. After use the handle is turned back again, by which everything is set out of action. This arrangement, besides the great convenience it affords, prevents all unnecessary wear of the acting parts.

In order to enable the final operation to be performed in the perfectly closed case, a parallel action and sliding rod serves to lift the rider and place it in the required position with the greatest ease. The rider can be used the whole length of the beam.

To ensure greater strength the whole is fixed to a stout glass plate which is supplied with two spirit levels. The Balance is so arranged that it can easily be taken to pieces and put together again. The pieces, when apart, fit in a box, and can be carried about without any fear of injury in the transport. The knife edges and their supports are made of agate, and most carefully finished.

The form I have adopted for the smaller weights from 0·5 downwards will also be found very convenient. They are made of wire, turned up into a flat spiral, the inner end projecting and forming a little upright by which it can easily be taken hold of. The number of coils indicates the number of units in each decimal, and the decimals themselves are distinguished by different thicknesses of the wire.

An inspection of this Balance is respectfully solicited at my office, **55, Upper Marylebone Street, Portland Place, London, W.**

O. WOLTERS,
(Many years with L. Oertling,)
Manufacturer of Weights, Chemical, Assay and Bullion Balances.

THE ANALYST.

BUTTER ANALYSIS IN SCOTLAND.

We have received a copy of the "Glasgow Herald," of the 9th inst., in which there appears a letter from Dr. Dittmar, attacking this journal for an alleged inaccuracy in a report in its last issue of a recent, notorious butter case, and for a short article on the subject.

If we have really mis-reported Dr. Dittmar, we very willingly apologise for the inadvertence, and shall be happy to print any correction of our report which Dr. Dittmar may choose to send us.

We believe we are pretty well served in the matter of information, but we are free to confess, that for police court reports, we have to depend in a great, measure upon local newspapers.

In the present case we selected from a number of reports the one which appeared to us the clearest and fairest, and reports almost identical in terms had appeared in the "Times," as well as in several scientific journals.

Dr. Dittmar writes as though we had some personal feeling against him, and insinuates that we should probably refuse to insert any communication from him.

In this we know that he does us an injustice, and we think he greatly exaggerates the point at issue, which after all simply comes to this:—

We reported that Dr. Dittmar had affirmed that finding certain actual results from the analysis of a sample of butter, he was of opinion that the same was genuine.

As we understand his letter, what he reported (or meant to report,) was, that though the results were capable of being put into figures, (which figures were closely accordant with those yielded by the analysis of "Butterine," but wholly uncompatible with the idea of the substance being genuine butter;) he was unable to come to any definite conclusion as to whether or not the sample was pure.

We put it to Dr. Dittmar, whether if a man holds himself out to analyse butter, he should not after submitting the sample to a careful examination be able to form some conclusion as to its genuineness.

If a chemist is unable to draw any deduction from the figures of his analysis, it appears to us that whatever may be his eminence in other walks of science, he would do wisely to eschew the analysis of butter.

SOCIETY OF PUBLIC ANALYSTS.

The country meeting of the Society was held at Bath Street, Glasgow, on Tuesday, the 12th inst., Mr. Wanklyn in the chair.

The minutes of the last General Meeting were read by Dr. Clark (who acted as local Secretary), and confirmed. Dr. Cameron referred to the report of a case of adulteration of butter, which appeared in the last number of the "Analyst," and which was said to be inaccurate, so far as it concerned Dr. Dittmar, and to an article which also appeared, headed "Butter Analysis in Scotland." After some discussion it was suggested that Dr. Dittmar should be advised to write to the "Analyst" and explain the matter.

The following papers were then read, a discussion in most cases ensuing:

On Enamelled Cooking Vessels, by R. R. Tatlock, F.R.S.E., F.C.S.

Note on the Solution of difficult Soluble Substances, by A. H. Allen, F.C.S.

On the Composition of Gases Evolved in White Lead Stacks during the Corrosion of Metallic Lead, by G. W. Wigner, F.C.S., and R. H. Harland, F.C.S.

Messrs. Wallace, Tatlock, and Clark were thanked for kindly granting the use of their hall for the purposes of the meeting, and a special vote of thanks was accorded to Dr. Clark for his services as Secretary on the occasion.

ON ENAMELLED COOKING VESSELS.

Read before a Meeting of the Society of Public Analysts at Glasgow, August 12th, 1876,

By R. R. Tatlock, F.R.S.E., F.C.S.

It will be readily conceded that if it is requisite to have our food and drink pure and genuine, it is almost equally desirable that the vessels in which they are prepared for use, should be of such a character as to ensure that they will not be subject to any contamination, or have imparted to them any quality which would render them injurious, or even objectionable.

The Food and Drugs' Act, 1875, does not make any provision for dealing with the sale of dishes, or vessels, which, on account of the nature of the materials from which they are manufactured, must in many instances inevitably introduce poisonous or hurtful ingredients, into the food or drink, which may be prepared or contained in them; and it is questionable, whether officials appointed under the Act, would consider it any part of their duty to interfere with the sale of these.

It is therefore all the more necessary that attention should be called to the question, in order that, if possible, moral influence as well as future legislation should be brought to bear upon it.

Brass vessels for boiling fruit, in making preserves; and also "preserved meat" tins, the coating metal of which is partly composed of lead, have again and again been pointed out as examples of the articles referred to, but it is exclusively with enamelled cooking vessels that this communication has to do.

The nature of "Enamel," or at least of the white, porcelainous kind most commonly met with on cast iron cooking vessels, admits of great variety as regards the ingredients it contains, and their proportions, upon both of which the properties and character of the enamel depend.

Thus, we may have poisonous ingredients, such as Lead or Arsenic, present in comparatively large quantity, without the risk of having even a trace of either of these metals imparted to any food cooked, provided sufficient silica has been employed in the composition to make a glass not readily acted upon by common salt, vegetable acids or other ordinary dietetic substances. But if, on the other hand, a deficiency of silica be used, the same proportions of lead and arsenic will give an enamel the use of which would be attended with great risk, on account of the easy action upon it of many of the substances employed in the preparation of food.

That enamels, in practice, differ largely in composition as well as in properties, will be seen from the following analyses and experiments, which refer to three samples of white opaque enamel taken from three cast iron cooking pots as sold for use, made by three different manufacturers.

	1. Per Cent.	2. Per Cent.	3. Per Cent.
Silica	61·00	42·40	42.00
Alumina	8·00	2·88	6·06
Oxide of Iron	1.10	2·04	4·04
Lime	3·02	·16	·78
Magnesia	·28	·10	·21
Oxide of Lead	Absent	25·89	18·48
Potash	5·61	7·99	6·46
Soda	20 67	14·67	19·25
Phosphoric Acid	Trace	Trace	Trace
Arsenious Acid	·02	·42	1·02
Carbonic Acid	·30	Absent	Absent
Boracic Acid	Absent	3·45	1·70
	100·00	100·00	100·00
Bases	38·68	53·73	55·28

The most superficial study of these Analyses will shew that Nos. 2 and 3, although differing considerably in composition, are of the same class, both being quite different from the No 1 in the following respects:—

1. The ratio of the total amount of bases simply added together, (without taking into account the difference in their combining proportions) to the silica is as 1 to 1·58 in No. 1; 1 to ·79 in No. 2; and 1 to ·76 in No. 3, so that in the first-named sample the ratio of the silica to the bases is twice as great as in the other two.

2. Lead is absent in No. 1, while the other two contain it in very large proportion.

3. No. 1 contains only 1-20 part of the amount of arsenic present in No. 2, and 1-50 of that contained in No. 3.

At first sight it seems rather startling that a fatal dose of arsenic should be contained in one ounce of the enamel of a vessel intended for cooking purposes, but this fact alone would not be of so much consequence were it not for the basic character of the enamel, rendering it easily acted upon by ordinary dietetic substances, and even by water.

It is impossible, however, to determine, from the composition alone of any enamel, whether it will, in the ordinary circumstances in which the vessel is used, give out any of the poisonous ingredients which it may contain, and it, therefore, becomes necessary to ascertain this point by direct experiment. With this object the pot prepared with the No. 3 enamel was subjected to the following tests:—

1. A one per cent. solution of citric acid was boiled in the pot for a few minutes. The fluid was then cooled and tested for lead by sulphuretted hydrogen. A dense black precipitate was at once obtained, which settled immediately; and on concentrating a further portion of the fluid, and testing for arsenic the presence of that metal was distinctly established.

2. A quantity of water containing about 3 per cent. of common salt in solution was boiled in the same pot for a few minutes, and the solution cooled and tested with solution of sulphuretted hydrogen.

A black precipitate of sulphide of lead was at once obtained.

A further portion of the fluid was concentrated and tested for arsenic, but none could be found.

3. A quantity of gooseberry jam was boiled for a short time in the same vessel, and the result tested for lead in the same way. The re-action was sufficiently distinct, but the presence of arsenic was not satisfactorily proved. A blank experiment shewed that the jam did not contain a trace of lead originally.

There was no difference in the appearance of these enamels, which could be of the slightest service in enabling any one to distinguish between them, so that nothing short of a chemical examination could determine whether they were objectionable or otherwise.

Is may be worth noticing, however, that when the basic enamel is boiled with citric acid solution of 1 per cent. strength; its surface loses its glassy appearance and becomes quite dull, while a perfect enamel is unaffected.

It will be, of course, at once seen that the object of the manufacturer in the employment of arsenic, is to obtain a milk white porcelainous enamel, and that by the use of lead, the materials can be fused at a much lower temperature, but it is evident from the analysis of the No. 1 enamel, that both of these ingredients *can* be dispensed

with, that sample being quite white, and yet containing only a comparatively minute quantity of arsenic, which on account of the siliceous character of the composition, is not acted upon by ordinary agents. The makers of the objectionable article are therefore all the less entitled to consideration. They must be well aware that they are introducing into cooking vessels, of even small dimensions, many fatal doses of arsenic, but they possibly are under the impression, through ignorance of the properties of the ingredients they are working with, that the arsenic is volatilised in the process of melting on the enamel.

The action of salt and other substances upon these objectionable varieties of enamel is not the only means by which poisonous matter may be introduced into food. It may also take place by the cracking and subsequent breaking off of the enamel, and it is not difficult to see that this might readily take place in such a way that the substance would be in a highly comminuted state, and consequently would escape observation.

It is undoubtedly very desirable to have iron cooking vessels enamelled, but if utensils thus prepared are not to be a source of injury to health, one of two ways must be followed:—Either the poisonous ingredients must be entirely left out of the compositions, or these must be of such a character that they will not be acted upon by ordinary ingredients in the circumstances under which the vessels will be subjected to use.

In a brief discussion which ensued: Dr. Clark, stated that several of the manufacturers of enamelled pots were experimenting with the view of producing an enamel perfectly free from lead and arsenic, and he had no doubt that if the attention of the public was called to the presence of poisonous substances in the enamel of pots, manufacturers would immediately alter the composition of their enamels, and keep out the hurtful ingredients.

Mr. Tatlock, stated, that he had purchased, within the last two days, two enamelled pots, one of which seemed free from objection and remained unaffected by a 1 per cent. solution of citric acid, while the other was acted upon to such an extent, that an enormous quantity of lead was dissolved out with ease.

CORRESPONDENCE.

BUTTER ANALYSIS.

TO THE EDITOR OF THE "ANALYST."

SIR,—I have no time to enter into a controversy on this subject, and even if I had, I think it is our duty not to squabble about small points of priority, but to work together in an amicable spirit, and finally to adopt whatever modification in the mode of estimating the fatty acids which may prove the most workable in our hands. The great point is the origination of the idea, and if Dr. Dupré will refer to the *Food Journal* for 1870, pages 586-7, he will there find that I was at that date engaged in studying the analysis of butter, and duly announced my process to be the estimation of amount of the fatty acids, which I stated would be found to be the only reliable method. This much in self defence, and the rest I leave to time and experience in the hands of my *confrères.*

Yours &c.,

JOHN MUTER.

WE have received from Mr. Sidney W. Rich a letter criticising our criticism of his "Analysts' Annual Note Book."

We should have been glad to have inserted Mr. Rich's letter if space had allowed of it. At the same time we beg to assure Mr. Rich that we had no intention of treating him unfairly, and do not think we are open to the charge of having done so.

It cannot, however, be disputed that a great part of his matter is taken, without acknowledgment, from the "Proceedings of the Society of Public Analysts." Whether from the bound volume or as they appeared weekly is not material.

ON THE COMPOSITION OF THE GASES EVOLVED IN WHITE LEAD STACKS DURING THE CORROSION OF METALLIC LEAD.

By G. W. Wigner, F.C.S., & R. H. Harland, F.C.S.

Read before the Society of Public Analysts, at Glasgow, August 12th, 1876.

The ordinary process of manufacturing white lead by what is called the Dutch method is familiar to all chemists, but, as far as we are aware, no investigation has ever been made into the composition of the gases contained in the stacks during the process of corrosion. Such an investigation is, nevertheless, important, because it is these gases which "corrode" the metallic lead, and form the white lead, and the presence of an unusual proportion of any gas may alter the composition of the compound produced.

In order to render the technical terms intelligible it may be necessary to call attention to the ordinary mode in which stacks are constructed. The stack is enclosed by four walls, generally approximating to a square, having one opening, called the door, from floor to roof. This opening is closed, as the stack is built, by boards fitting loosely together. The walls are sometimes lined as the stack is built by "margins" some six to twelve inch thick of tan, which are kept in place by loose fitting boards.

In "building" the stack a number of successive layers are added, which are somewhat as follows: First, three feet of tan; second, earthen pots filled with diluted crude acetic acid; third, the lead to be corroded, cast into "crates" or "plates," and stacked loosely to a thickness of perhaps nine inches; 4th, a flooring of boards supported either on large pots or on suitable wooden supports. This flooring is generally double, so as to prevent small pieces of tan from falling through the crevices between the boards. These four layers constitute what is called a "heat," and the stack itself is composed of eight to twelve of these "heats," each subsequent heat differing only from the first in having a much thinner bed of tan, say 1 foot instead of 3 feet. The top heat is covered over with a layer of spent tan, to retain the warmth.

When the stacks are built, the tan (which usually contains about half its weight of water,) from its necessary turning over and exposure to the air, has a comparatively low temperature, which, although it varies greatly, may probably be averaged at 100° F. When the stacks are finished and really at work the temperature will rise much higher, sometimes even to 180° F.

The proportion of actual acetic acid used is generally less than one per cent. of the metallic lead, and it is obvious that this cannot act to any sensible extent as a source of carbonic acid. This gas must, therefore, be produced almost, if not entirely, from the oxidation of the carbonaceous matter contained in the tan. The action of the acetic acid probably converts the lead into one of the sub-acetates, and the carbonic acid decomposes this salt, forming a carbonate of lead.

As it is clear that the tan has to produce the carbonic acid gas, we will consider the quantity of this gas necessary. In a stack 15 feet square, and consisting of ten heats, about 35 tons of lead would be stacked, and at a fair estimate, one-half of this would be corroded, (say 17½ tons.) This will produce about 22 tons of white lead. The proportion of carbonic acid present in this white lead, will vary in extreme cases from 10½ to 16 per cent., but the average may be assumed to be 12½ per cent. 22 tons = 49,280 lbs., 12½ per cent. of which is 6,160 lbs. of carbonic acid required, assuming that no waste takes place. This requires the combustion of 1,680 lbs. of carbon. The bulk of this carbonic

acid will be about 53,000 cubic feet, at a temperature of 60° F. The same bulk of oxygen, will, therefore, be required for the production of the carbonic acid, but as atmospheric air contains less than 21 per cent. of oxygen, and as we cannot reckon that, under ordinary circumstances, more than one-third of this can be brought into combination with carbon, at the temperature existing in the stacks, this 53,000 cubic feet will only represent 7 per cent. of the total atmospheric air requisite. The total quantity of air required will, therefore, be 757,000 cubic feet, even allowing for 7 per cent. of oxygen being utilized. This is, therefore, the minimum quantity needed, and the results of the analyses which we will give will show that this minimum is probably only a fraction of the quantity actually necessary.

Such a stack as we have described will probably take twelve weeks to work. Twelve weeks=120,960 minutes. The minimum quantity of air necessary is, therefore, only between 6 and 7 cubic feet per minute, or say the entire change of the air in the stack every six hours.

Even allowing that these figures represent, as is probably the case, only about one-fourth of the actual quantity of air passing into the stack, the fact, that under these circumstances, the air in the stack would only be changed once in about 1½ hours, and would, therefore, have an upward movement at the rate of about 3 inches per *minute*, will probably be sufficient to account for the smallness of the air passages through the flooring boards, which have been found sufficient in practice to pass air from one heat to another.

This explanation does not, however, seem to us sufficient to account for the imperfect mode in which air is at present admitted into the stack itself, namely, through the chinks in the boards forming the door. It appears obvious that all this air should enter through the bottom, *i.e.*, the thick stratum of tan, and thence after being partially heated, and carbonated pass upwards, receiving fresh supplies of carbonic acid at each heat. In practice however, there is equal facility for the entrance of air at each heat, and this air is not compelled to pass through any tan, (except the margins,) before it reaches the white lead, and its effect is consequently diminished. It seems clear that a due admission of atmospheric air below the bottom tan, combined with complete exclusion of in-currents at any higher point, would produce a more effectual and uniform corrosion than is at present obtained.

Having thus considered the general points in the process employed at the present time, we will pass to the actual results obtained in the analysis of a large number of samples of gases taken while the stacks were at work.

The mode in which these gases have been collected is as follows:—We have had an iron tube constructed for the purpose of driving or screwing through the door into the interior of the stack. This tube is about 6 feet long, made of 1 inch gas pipe turned smooth outside, at one end it is plugged by a pointed steel plug, drilled with a large number of holes about ⅛-inch in diameter, to admit the gas. At this end of the tube for a length of about 2 feet, a spiral of very thick iron wire, forming a screw of about 1 inch pitch is brazed on to the exterior of the tube; the other end is fitted with a double ended lever wrench, so as to enable the tube to be turned round. The mode of using this tube is as follows:—A hole about 1-inch in diameter is bored in the door, the point of the tube is inserted, and the lever wrench turned round, the screw immediately seizes on the wood, and the tube is forced forward into the stack, when the screw loses

its hold on the wood, it retains enough hold on the tan to force its way in, and there is seldom any difficulty in getting the tube five feet into the stack. If the point should come into contact with a "pot," the force is almost always sufficient either to dislodge or break the latter.

When the pipe is screwed in far enough, a registering thermometer is pushed in to the end, a small bent copper tube ½-in. diam. is then screwed on to the outer end of the iron tube, and the sample can then be taken.

We prefer to collect the gas in one of the collecting tubes, a description of which by G. W. Wigner appears in the "Proceedings of the Society of Public Analysts," page 97, as by that means we avoid the trouble of sealing glass tubes, and also enable the gas to be more readily transferred to the laboratory tube for analysis. One of the India-rubber tubes on this collecting tube is slipped securely on to the bent copper tube already mentioned, and the other end is connected to a small Tate's air-pump fitted on a stand, and air equal to about twenty times the capacity of the entire tubes is exhausted. The screw clamps are then closed, the collecting tube containing the air detached, and the registering thermometer withdrawn to ascertain the temperature.

The samples of air have all been analysed either by the Mc Leod apparatus, or by an improved form of it devised by Mr. Wigner. In every sample, determinations of carbonic acid and oxygen have been made, and in many cases carbonic oxide and acetic acid have been tested for.

As to the general characteristics of the samples, we may premise that we have analysed some hundreds of different specimens taken at all ages of and from many different positions in, the stacks, and we think we have therefore sufficient *data* on which to base a sound opinion.

All the samples were found to be saturated with vapour; this was of course to be expected from the presence of so much water in the tan, and diluted acetic acid. On drawing this moist air into the collecting tube condensation invariably took place, and we have tested this condensed water for acetic acid, but only one sample in the whole series has *shown* the least traces of it. We think that in this case the point of the iron tube had been forced into an acid pot, and a few drops of the liquor drawn over. It is therefore clear, that no sensible amount of acetic acid vapour can be discovered in the air of the stack. On another occasion we used an aspirator, and drew about two cubic feet of gas from a stack, in small bubbles through a wash bottle, but even in this way it was impossible to say that acetic acid vapour was present.

Nevertheless in some instances we have distinctly noticed the odour of acetic acid, as distinguished from the peculiar smell which the stacks always have.

It was thought possible that some of the carbonaceous matter might oxidise into carbonic oxide, instead of carbonic acid, and a considerable number of samples were tested for this gas, but only in one case was any found.

The sample in question was drawn from the second heat of a stack which had been thirteen weeks at work. The temperature had fallen very low, viz., to 106°, and the stack was consequently working very slowly. The proportion of carbonic oxide was ·47 per cent. Other samples taken from the same place two or three days before, and two or three days later were tested, and did not show any carbonic oxide, and samples from other parts of the stack gave the same negative result. We cannot venture any opinion as to the cause of this exceptional sample, but can only say that we believe the analytical results to be correct.

The percentage of carbonic acid gas present was found to vary to an excessive extent. The maximum and minimum found in our analyses, being respectively 27·27 per cent., and "traces only."

These are beyond the ordinary variations, which usually range between ·50 and 4·50 per cent.

Up to the present time we have been unable to discover any rule governing *these* variations.

They are evidently not dependent in any way on the age of the stack, for we have had samples of 5 weeks old giving ·60 per cent. CO_2, 1·16 per cent. CO_2, and 1·76 per cent., respectively, and of 9 weeks old giving ·22 per cent., ·67 per cent., and 2·92 per cent., and of 13 weeks old giving "none," ·75 per cent., and 1·33 per cent. respectively. Neither does the proportion appear to bear any definite relation to the temperature, for we have had a temperature of about 150° associated with the entire absence of carbonic acid, and with the presence of 1·10 per cent. and 1·67 per cent. respectively, while with a low temperature of about 110°, we have had ·07 per cent., ·50 per cent., and 3·39 per cent. respectively.

The only approach to a rule appears to be, that when a stack is entirely worked off, *i.e.*, when the temperature has fallen to say 105°, and the production of white lead has virtually ceased, it is rare to find more than about half a per cent. of carbonic acid present.

It would certainly be an advantage to the workpeople employed, if this portion could be removed prior to stripping. Some experiments made with this object, by opening a large aperture at the bottom of the door, and removing the cover of tan at the top, have been attended with partial success, and if proper arrangements were made it appears as if such an arrangement would prove advantageous to the product, as well as beneficial to the health of the people employed.

The percentage of oxygen present in the samples is also very variable, but here, despite many discrepancies, there is some approach to a law governing the quantities found.

This rule appears to be as follows: At the time of stacking, the air included in the stack is of course atmospheric, which, considering the character of the factory, may probably be assumed to contain 20·7 per cent. of oxygen. As the stack starts work this proportion diminishes, and after two weeks will probably average about 17 per cent; after 5 or 6 weeks' more work the proportion will be lower still, the average being probably between 13 and 15 per cent, exceptional samples falling as low as 6½ per cent. This is unquestionably the period of greatest activity in the stack. After this the proportion greatly, but irregularly, increases, and at 11 weeks will average about 17 per cent. It still increases until the stack is practically worked off, when it will range from about 19·5 to 20·6 per cent.

From this fact we find that it is possible to deduce one certain rule, namely, if a stack has been some few weeks at work, and the temperature has fallen to say 110° or 115°, and the analysis shows 19·5 to 20·0 per cent. oxygen, with not more than ·75 per cent. carbonic acid, all work in the stack is practically finished, and it is better to strip it at once rather than wait, (even though the time is not up) for the comparatively trivial amount of corrosion which may be still going on.

We will now pass from the general view of the question and give some specific illustrations of the results obtained. A stack, which we will call No. 1, was sampled when it had been nine weeks at work, and the results were :—

	2nd Heat.	6th Heat.
Carbonic Acid ...	·00 per cent.	·22 per cent.
Oxygen ...	14·92 „	17·05 „
Temperature ...	154°	156°

It was again sampled two weeks later, the spouts through which the air escaped at the top having been meanwhile partially closed. The results were :—

	2nd Heat.	6th Heat.
Carbonic Acid ...	·50 per cent.	·50 per cent.
Oxygen ...	17·46 „	17·46 „
Temperature ...	109°	109°

It will be observed that the temperature was 45° lower. The carbonic acid had increased, and the two samples, which previously differed greatly, were now identical in every respect. This last fact, we are inclined to think, indicates some slight displacement in the boards of the stack, so as to allow a more perfect circulation of the air from heat to heat.

No. 6 heat was sampled one week later. The results were :—

	6th Heat
Carbonic acid	·95 per cent.
Oxygen	13·25 „
Temperature	152°

These figures are remarkably discordant from the previous results. They clearly show that the stack had "started work" again. Possibly this might be due to a sudden influx of fresh atmospheric air, due to the cause suggested above, but this is only a supposition.

In consequence of this anomalous result the stack was again sampled two days later at the same heat. The results were :—

	6th Heat
Carbonic acid	·17 per cent.
Oxygen	17.92 „

These results are fairly concordant with the results of last sample but one.

After 9 days more, *i.e.* 13 weeks and 4 days altogether, the results were :—

	No. 2 Heat.	No. 6 Heat.
Carbonic acid	·08 per cent.	Traces per cent.
Oxygen	19·45 „	16·13 „
Temperature	93°	120°

These last analyses clearly show that No. 2 heat had entirely stopped from useful work, but that No. 6 was still probably doing good work. The stack was allowed to stand three or four days longer and then stripped.

The produce of the stack was good in quality and quantity.

A stack which we will call No. 2, was furnished with two spouts for carrying off the gases. When the stack was built these spouts were covered. The gas was sampled after four weeks' work. The results were :—

	2nd Heat.	6th Heat.	7th Heat.
Carbonic acid ...	·97 per cent.	·81 per cent.	·60 per cent.
Oxygen ...	17·56 „	17·44 „	14·53 „
Temperature ...	110°.		184°.

The covers were then removed from the spouts, and after twelve days more the results were :—

	2nd Heat.	6th Heat.	7th Heat.
Carbonic acid ...	·67 per cent.	·88 per cent.	·66 per cent.
Oxygen ...	17·86 „	16·78 „	16·01 „

The stack worked eight days longer, say seven weeks in all, the results then were :—

	2nd Heat.	7th Heat.
Carbonic acid	·96 per cent.	·71 per cent.
Oxygen	18·49 „	13·60 „
Temperature	80°.	166°.

Some cause had evidently stopped the work of the lower heats. The temperature 80° and the high oxygen 18·49 per cent. clearly show this, while the upper heats were working vigorously. Yet the proper "time" of the stack was little more than half over.

A sample of No. 2 heat, twelve days later, *i.e.* nearly nine weeks from start, confirmed this result. It showed:—

	2nd Heat.
Carbonic acid	Traces per cent.
Oxygen	19·85 „
Temperature	82°.

This analysis proved that very little action was taking place, and the second heat was again analysed fourteen days later on, or nearly eleven weeks from start. The results were:—

	2nd Heat.
Carbonic acid	·39 per cent.
Oxygen	17·89 „
Temperature	112°.

These figures clearly prove that this heat was at work again, and that the cause (which was probably due to an irregularity in the supply of air) which had produced the original stoppage had been removed. We were unable to sample this stack again, but when it was stripped the two bottom heats, which had given such anomalous results, gave *poor corrosions and inferior white lead*, while the upper heats were all extremely good.

These results certainly point to the desirability of some ready mode of adjusting the inlet of atmospheric air instead of allowing it to take its course through any chinks or crevices which may, and in fact are, produced by the irregular settlement of the stack.

Having given these two examples of the consecutive samples taken from a given stack, we will now give in a tabular form, the averaged results of about 100 analyses, arranged in order of the age of the stacks at the time the samples were taken.

These results are selected from the total number which we have obtained as being the most typical, or in other words as representing most nearly the maximum, minimum, and average results, obtained from stacks which were working in ordinary course, and not under any unusual conditions.

AVERAGE RESULTS.

Series.	Age in Days.	Carbonic Acid.	Oxygen.	Maximum and Minimum of Oxygen.	No. of Samples averaged.
1	1 to 10	·51	19·04	19·64 ... 18·73	3
2	11 „ 20	1·64	17·60	20·22 ... 11·35	11
3	21 „ 30	3·40	18·79	20·07 ... 16·36	7
4	31 „ 40	·59	17·12	20·47 .. 12·64	4
5	41 „ 50	4·29	13·01	20·61 ... 7·12	12
6	51 „ 60	1·49	14·70	20·23 ... 6·57	9
7	61 „ 70	1·10	15·55	19·77 ... 5·91	13
8	71 „ 80	·65	15·74	20·03 ... 6·53	12
9	81 „ 90	·76	17·49	20·24 ... 15·22	15
10	91 „ 100	·46	19·13	20·57 ... 16·30	15

One other point appears worthy of consideration in connection with this subject. The results which we have given tend to show the necessity of properly regulating the admission of air to white lead stacks, and also confirms the old opinion that the temperature of the stack has a most important effect on the produce. The cooling effect of a considerable current of cold air, may under some circumstances, be so detrimental as

to more than counter-balance the good effected by the formation of carbonic acid, or in other words it may be desirable in some cases to heat the ingoing air. We are not at present prepared to enter at all fully into the discussion of this question, but we will merely point out a few of the facts.

We have already shown that in our ideal stack, at least 1680 lbs. of carbon must be consumed to produce the necessary carbonic acid. This carbon would in its combustion produce 24,450,000 units of heats, *i.e.*, raise 24,450,000 lbs. of water, 1° F. We have assumed that in round numbers 3,000,000 cubic feet of air, say 230,000 lb. must pass through the stack. The specific heat of air being ·2374, and the increase of temperature necessary, being assumed to average 60° t) 160°, we shall require 5,478,000 heat units to heat this air. The stack will contain, according to our estimate, 35 tons of lead, and perhaps 35 tons more of tan, pots and boards. At a fair estimate we cannot assume more than 500,000 units of heat for heating these.

We have now about 18,500,000 units available for the evaporation of the water in the tan, and in the diluted acetic acid, and for replacing the losses occurring by the escape of heat from the spouts, &c.

If these latter losses are reduced as they ought to be to a minimum, we certainly ought to have surplus heat enough to enable us when it is required to let more air pass through the stack and so increase the oxidizing action, and the corrosion. If air is admitted in this way, it is essential that it be done with discretion, and in such a manner as to avoid unduly lowering the temperature of the stack.

During these experiments we have upon several occasions analysed the air of the factory from which the samples were procured; three samples taken from the top of the tan, covering the top heat have shown the following results:—

	No. 1.	No. 2.	No. 3.
Carbonic acid ...	0·00 per cent.	·29 per cent.	·78 per cent.
Oxygen ...	19·83 „	19·69 „	18·25 „

Three more samples taken from the confined passages closely adjoining the mouths of the stacks showed,

	No. 1.	No. 2.	No. 3.
Carbonic acid ...	0·00 per cent.	0·00 per cent.	0·08 per cent.
Oxygen ...	20.46 „	20·35 „	20·18 „

These last three are probably typical of the worst air which the workpeople would be compelled to inhale. In conclusion we would point out that white lead makers may evidently gain much information from the periodical examination of the gas in the stacks, and that the careful collation, and examination of these results may enable improvements to be made in the process of white lead manufacture.

We have intentionally avoided any reference to the analyses of the white lead produced in these stacks, as this paper is already, we fear, too long.

In reply to Mr. Allen: Mr. Harland, stated that the carbonic oxide found in one particular sample was determined by absorption with solution of cuprous chloride, after the oxygen had been taken up by means of pyrogallate of soda. Mr. Wanklyn, suggested, that the carbonic oxide had been formed by the action of the pyrogallate of soda, as some researches tended to show that carbonic oxide was produced when oxygen was absorbed by this substance in the proportion in which it existed in atmospheric air.

Mr. Harland, replied, that about 100 samples of the air from different stacks had been tested for carbonic oxide, each in exactly the same way, and under similar conditions, and that the slightest trace of absorption by the cuprous chloride (if amounting to only ·5 *mm.*), could be detected.

In every case, however, with the exception of the one instanced, the gas measured exactly the same, after cuprous chloride, as it did after treatment with pyrogallate of soda.

ON THE FRADULENT COLOURATION OF WINES.

By A. Gautier.

Bull. Soc. Chim., [2] xxv. 435-44; 483-498, and 530-538.

(Continued.)

The following Table (*A*) has been prepared, in order to show the action of re-agents upon the substances employed for the fraudulent colouration of wines, both when the substances in question were in a pure state, and when mixed with pure wines, in such proportion, that of the total intensity of the colour of each mixture, about one-fifth was due to the foreign colouring substance. In all cases, before commencing the tests, the samples were shaken for some minutes, with one-tenth their volume of white-of-egg, albumin; (which had been previously diluted with one-and-a-half times its bulk of water), and then filtered, whereby the filtrate was rendered comparatively richer in the adulterating substances, shown in Table *A*.

In order to make these reactions practically useful, much care has been given to the relative constancy and value of each, and as a result, a systematic method of research has been arranged and is shown in Table *B*.

Even with every precaution in the process of examination, cases may arise in which some uncertainty may exist. In such cases, further examination by other reactions must follow. The mention of one and the same substance may for that reason occur in various places in Table *B*.

PRELIMINARY PREPARATION OF THE SAMPLE.

The wine to be examined is mixed with one-tenth its volume of white-of-egg, previously diluted with one-and-a-half times its bulk of water, well shaken, and after standing for half-an-hour, filtered. If the wine is very poor in tannates, a few drops of a fresh acqueous solution of tannin should be added previous to the agitation with albumin.

The filtrate is treated with dilute sodium bicarbonate until its re-action is *very* feebly acid. All the re-actions of Table *B*, must be made on this liquid, except those for indigo, which are executed upon the albuminous precipitate.

TABLE B.

SYSTEMATIC PROCESS TO BE FOLLOWED FOR THE DETECTION OF THE NATURE OF FOREIGN COLOURING MATTERS ADDED TO WINES.

A. Having placed aside the filtrate from the albuminous precipitate, the precipitate is washed until the washings are almost colourless.

Two cases may present themselves:

(*a*). The precipitate after washing, remains wine-coloured, lilac, or maroon, *natural wine, or may be adulterated with the greater part of the substances usually employed.* Pass on to C.

(*b*). The precipitate is of a very deep wine colour, violet blue, or bluish, *wines from the deepest coloured grapes; or wines coloured with indigo.* Proceed to B.

B. The precipitate is washed with water, then with alcohol of 25 per cent., a part is then removed and boiled with alcohol of 85 per cent.

(*a*). The filtrate is *rose*, or *wine-coloured*. A portion of the precipitate is removed from the filter, suspended in water, and carefully saturated with dilute potassium carbonate. The colour changes to brown or blackish brown *natural wines*, or may be adulterated with substances other than indigo. Pass to C.

(*b*). The filtrate is *blue*. A portion of the precipitate suspended in water and treated with dilute potassium carbonate affords a deep blue liquid, which changes to yellow by an excess of the reagent. Various preparations of indigo. Indigo.

	K.
fied of a ...on of ...on ...te.	...lour of the filtrate from H.
...or	Clear bottle-green, almost colourless with certain rare varieties.
	"
...to	Geey, with a little maroon.
	"
...ed ...ng ...ng	Clear bottle-green.
	Liquid always rose, more or less deep.
...ly	Rose lilac.
	"
...ph	Clear green.
	"

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C. Two c.c. of wine are treated with 6 to 8 c.c. of a 1-200th solution of sodium carbonate, which must be added in slight excess (1 c.c.) after the change of colour.

(*a*). The liquid becomes *lilac*, or *violet*, sometimes the liquid becomes only winey, or dashed with violet. *Brazil wood, cochineal, Portugal berries, fuchsine* ... ... *wines of certain sorts, fresh beetroot, logwood, both elders, whortleberries* (myrtille), *Portugal berries.* Pass to D.

(*b*). The liquid becomes bluish-green, sometimes with a faint lilac tint, *wine, hollyhock, privet whortleberries, logwood, Portugal berries, fuchsine.* Pass to M.

(*c*). The liquid becomes greenish-yellow without any blue or violet, *beetroot,* (old or fermented decoction), *whortleberries, certain rare varieties of wine.* Pass to L.

D. The liquid *C. a.* is heated to boiling.

(*a*). The liquid remains wine-violet, rose, or wine-lilac, or becomes a brighter lilac ; *logwood, Brazil wood, cochineal, certain varieties of wine.* Pass to E.

(*b*). The colour disappears, or changes to a yellow, or maroon, or reddish tint, *wine, fuchsine, both elders* ; *whortleberries, Portugal berries, fresh beetroot.* Pass to F.

E. Treat 4 c.c. of the wine with 2 c.c. of each of a 10 per cent. solution of alum, and a 10 per cent. solution of crystalised sodium cerbonate. Filter.

(*a*). Clear yellowish-green lake (which may be bluish from mixtures of wines containing aramon), filtrate colourless, becoming very slightly yellow on warming ; its own volume of aluminium acetate at 2° B almost wholly decolourises it. On acidification with acetic acid, after treatment with its own volume of barium-hydrate (saturated solution), the wine becomes clear greenish-yellow *aramon, pure or mixed.*

(*b*). Greenish-blue lake, or dirty yellowish-green according to the varieties present, sometimes very slightly winey. Filtrate bright-rose, gradually decolourised on warming, though retaining a tinge of lilac; not decolourised by lime-water in the cold. COCHINEAL.

(*c*). Winey-violet lake, which darkens on exposure to the air. Filtrate bottle-green, or grey faintly red (if much logwood is present). The filtrate becomes green on warming. LOGWOOD.

(*d*). Lilac, or maroon-lilac lake. Filtrate greyish with tint of maroon. On boiling this filtrate becomes fine old wine coloured. BRAZIL WOOD.

F. Treat 4 c.c. of the wine with alum and sodium carbonate (as explained at *E*), add to the mixture two or three drops of very dilute sodium carbonate, and filter.

(*a*). The filtrate is lilac or winey, *Portugal-berries, fresh beetroot.* Pass to G.

(*b*). The filtrate is bottle-green, or reddish-green ; *wine, fuchsine, black-elder, whortleberries, beetroot.* Pass to H.

G. Treat 2 c.c. of the wine with subacetate of lead solution of density 15° B. Shake. Filter.

(*a*). The filtrate is rose which persists even when made slightly alkaline ; it slowly disappears on boiling. Lime water destroys the rose colour. PORTUGAL BERRIES.

(*b*). The filtrate is yellowish, or brownish-red. FRESH BEETROOT.

H. The alum-lake obtained from *F* (*b*) was :—

(*a*). Deep blue. On treating the clarified wine with a few drops of aluminium acetate solution, it becomes a decided violet, or wine violet. *Both elders.* Pass to I.

(*b*). Bluish-green. green, or faintly rose-tinted, *wine, whortleberries, beetroot, fuchsine.* Pass to J.

I. After the test *H* (*a*) treat a fresh quantity of 2 c.c. with 1·5 to 2 c.c. (according to its acidity and the depth of its colour) of an 8 per cent. solution of sodium bicarbonate charged with carbonic acid.

(*a*). The liquid remains lilac for a moment, then changes to greenish-grey blue. Another specimen treated with sodium carbonate (according to *C*), and heated to boiling becomes dark greenish-grey. BLACK ELDER.

(*b*). The liquid retains a lilac tint, or becomes grey with mixture of maroon, or dirty lilac. Another specimen treated with sodium carbonate (as at *C*) tends to discolour on heating, the green being replaced by red. DWARF ELDER.

J. Treat 5 c.c. of the clarified wine with a slight excess of ammonia, heat to boiling, and after cooling shake with 10 c.c. of ether, decant and evaporate the ether, and treat the residue left on evaporation with acetic acid.

(*a*). The liquid becomes red. FUCHSINE.

(*b*). The liquid does not become red ; *wine, whortleberries, fresh beetroot.* Pass to K.

K. Another specimen is treated according to *C* with sodium carbonate.

(*a*). The colour darkens or becomes red on heating, *whortleberries, fresh beetroot.* Pass to L.

(*b*). The greenish or bluish-green liquid, possibly having a winey tinge, has a tendency to discolour on heating. *Natural wine.*

L. Treated with sodium bicarbonate according to the rules given at I.

(*a*). The liquid is deep grey, slightly greenish, green, sometimes green with very slight lilac tint.

The clarified wine, treated with an equal volume of saturated baryta-water, filters after standing for fifteen minutes, dirty yellow, or slightly greenish.

With an equal volume of aluminium acetate of 2° B, it gives a lilac wine colored filtrate.

With a few drops of aluminate of potash no change of colour. With sodium carbonate, employed as at *C*, the liquid tends to lose its colour on heating. With barium peroxide, used according to Table A, column P, theliquid is faintly rose tinted, with or without an orange coloured deposit on the barium peroxide. NATURAL WINE.

With the general characters above indicated, if with baryta-water it affords a madeira-coloured filtrate, changing to buff on acidulation with acetic acid; if with borax it becomes deep-green with bluish caste; if with alum and sodium carbonate (as at E), a deep bottle-green with bluish tinge, precipitate falls, and if with aluminium acetate it remains rose-coloured with no change to violet-blue. TEINTURIER.

(*b*). The liquid is reddish-yellow or brown-lilac. By treatment with acetate of alumina the filtrate is clear lilac. With a few drops of aluminate of potash the colour becomes that of the skin of an onion, and with a larger quantity of the re-agent the colour is green, tinged with maroon. With sodium carbonate (employed as at *C*) the fluid passes to yellowish or greyish-yellow, with tinge of red. With barium peroxide, flesh-coloured liquid with considerable orange coloured deposit in contact with the peroxide. BEETROOT, *fermented or not.*

(*c*). The liquid is yellowish grey, with tinge of green or red. With baryta-water the filtrate is yellowish olive-green. With aluminum acetate the filtrate is bluish violet, or violet-lilac. With aluminate of potash, fresh rose, becoming yellowish-green, with an excess of re-agent. With sodium carbonate (as at *C*) the fluid becomes deep grey on heating. With barium peroxide the fluid is bleached, or remains but very slightly roseate, with a trace of orange deposit in contact with the peroxide. WHORTLEBERRIES.

M. The mixture of wine and alkaline carbonate *(C) (b)* is heated to boiling.

(*a*). The mixture becomes lilac-violet, or violet. LOGWOOD.

(*b*). The mixture tends to become decolourised, or changes to yellowish green, or dark green, or maroon-green ; *natural wines, whortleberries,* both *elders, privet, Portugal-berries, fuchsine.* Pass to N.

N. Treat the wine with alum, and sodium carbonate, as directed at *(E)* and filter.

(*a*). The colour of the filtrate is lilac. *Portugal-berries.*

(*b*). The filtrate changes to bottle-green, or reddish-green. *Natural wines, whortleberries, hollyhock, privet,* both *elders, fuchsine.* Pass to O.

O. Treat 2 c.c. of the clarified wine with 3 or 4 c.c. of a saturated solution of borax, according to the intensity of the colour of the wine.

(*a*). The liquid remains wine-lilac, or with some violet tinge. Both *elders, privet, Whortleberries.* Pass to P.

(*b*). The fluid becomes bluish-grey-flax-blossom, greenish or bluish-grey with very faint trace of lilac. *Pure* wine, *whortleberries, holyhock, fuchsine.* Pass to R.

P. Treat a new portion of wine with sodium bi-carbonate, (as directed at *I.*)

(*a*). The tint, at first lilac, changes afterwards to grey, slightly brownish, or to maroon. If a new portion be treated with sodium carbonate, according to (*C*) and then heated to boiling, it becomes clearer, and loses its green tint.

The lake obtained according to (*E*) is deep blue-green. Dwarf Elder.

(*b*). The specimen remains grey, tinged with green, bottle green, or yellowish. Sometimes (black elder) it acquires a lilac tint, which almost immediately disappears, changing to a greenish-grey-blue *whortleberries, black elder, privet.* Pass to Q.

Q. Treat a specimen of the wine with alum and carbonate of soda (as directed at *E*). Shake the mixture, and after a few moments throw it on a filter.

(*a*). The lake remaining on the filter is deep green-blue; the filtrate is clear bottle-green. A sample treated with sodium carbonate (as at *C*) darkens and becomes grey, slightly greenish, on heating to boiling. Black Elder.

(*b*). The lake is clear bluish or greenish. The filtrate is clear bottle-green. A sample treated with sodium carbonate (as at *C*), and heated to boiling, changes to dirty yellowish. Privet.

(*c*). The lake is ash-green faintly rose tinted. The filtrate is bottle-green, with tint of maroon. A sample treated with sodium carbonate (according to *C*) becomes deep grey on being heated to boiling. Whortleberries.

R. Treat a specimen of the wine with ammonia and ether as directed at *J*.

(*a*). The ether being decanted and evaporated, the fluid residue becomes rose-coloured on treatment with acetic acid. Fuchsine.

(*b*). The liquid left after the evaporation of the ether, does not become red on acidification with acetic acid, *natural wines, hollyhock, whortleberries.* Pass to S.

S. A sample is treated with its own bulk of a solution of aluminium acetate of 2° B.

(*a*). The colour of mixture remains winey, *natural wines, whortleberries*, differentiate between them, as directed at (*L a*), and (*L c*).

(*b*). The colour of the mixture becomes violet-blue, *hollyhock, whortleberries.* Pass to T.

T. A specimen is treated with alum, and sodium carbonate (as at E), and after a few moments filtered.

(*a*). The lake is clear green, slightly bluish, and rose tinted, filtrate is bottle green, with little maroon. With borax, (as at *O*), particularly if the sample has been concentrated, the liquid is grey with trace of lilac. Two c.c. of the liquid treated with 3 c.c. of dilute ammonia, (1 vol. of liq. ammonia with 10 vols. of water), and the mixture diluted with its own bulk of water, gives a liquid which is yellowish-grey, greenish or greenish-grey. The other characteristics (as at L). Whortleberries.

(*b*). The lake is green, slightly bluish, quite free from rose, filtrate clear bottle-green. With borax the liquid is greenish blue-grey. With ammonia (as above), dark bottle-green. With aluminium acetate, (as at *S*), bluish-violet colouration. Hollyhock.

Although somewhat difficult, this systematic method serves for the discovery of several colouring matters mixed in one wine, if the indications of Tables *A*, and *B*, are carefully observed, and followed. It is always desirable to determine the presence of Fuchsine, by the special re-actions given further on. By means of Table *B*, the presence of one or several of the colouring matters may be detected, but before deciding, it is as well to verify by repeating, for the substances so found the re-actions of Table *A*, on the sample; and also the more special characteristics given further on, for the identification of those substances.

SPECIAL RE-ACTIONS FOR THE DETECTION OF CERTAIN OF THE COLOURING MATTERS MIXED WITH WINES.

Brazil Wood.—Even a very strong clarification (two or three times more albumin than mentioned at the head of Table *B*,) does not wholly decolourise the adulterated

wine. It becomes yellow-buff, which on exposure to the air, gradually changes to red. If a wine that has been adulterated with Brazil wood is clarified, and then a skein of scoured silk, washed with dilute tartaric acid, be soaked in it for twenty-four hours, and then withdrawn, washed and dried at 60° to 70°, the silk will be found to be dyed lilac-maroon, or red. In pure wine, the skein remains wine-coloured or lilac.

If the dyed silk be now dipped into dilute ammonia, and heated to 100° for a moment, it becomes lilac-red, if Brazil wood was present; but deep grey with scarcely a tinge of its original colour if the wine were pure. If the ammonia be replaced by lime-water, the skein changes to ash-grey if Brazil wood were present; but to a dark, dirty-yellowish-red, if the wine were pure. Finally, if the skein be dipped into aluminium acetate, and then heated to 100°, it retains its wine-red lilac colour. This re-action differentiates Brazil wood from Logwood.

Logwood.—If the colour due to Logwood is in excess in the wine, ammonia gives it a shade of violet; if the proportion of Logwood is small, the re-actions *B*, *L*, *N*, of Table *A*, which are very delicate, should be tried.

Treated with a skein of silk, prepared in the manner described for Brazil wood, it becomes dyed lilac-red, or maroon, which dilute ammonia changes to violet-blue tinged with grey, and which by acetate of aluminium becomes bluish-violet.

Cochineal.—The lilac, or roseate tints due to the re-actions *A*, *B*, *H*, *K*, of Table A, are very sensitive, the last being very characteristic; the only substance likely to be confounded with it, being the phytolacca, (Portugal berries), which is differentiated by the re-action *B*. of the same Table.

A skein of scoured silk, mordanted with aluminium acetate, soaked in the clarified wine for 20 hours is dyed of a wine violet colour, analogous to that of pure wine, on being dried at 100°. The colour does not change, even at 100°, by cupric acetate (exclusion of fuchsine), but if the skein be dipped into a dilute solution of zinc chloride, heated to 100°, and then wetted with sodium carbonate, washed with water and dried, the colour becomes fine purple, whereas with pure wine, the tint would remain sombre grey-lilac.

Cochineal may be discovered by the spectroscope if present in large quantity, but if it amounts to only about 12 per cent. of the total colouration, it cannot be so detected. It rapidly separates from wines, being precipitated in the lees.

Fuchsine.—This should be sought for in all wines found to be adulterated with other substances. The re-action *J*. of Table B, is very sensitive. Great care must be taken to avoid loss of rosaniline from imperfect decomposition of its salts in solution, moreover, arsenic should always be sought for where the wine is found to contain any analine. Fuchsine rapidly separates from the wines to which it has been added A skein of silk becomes dyed rose by soaking in a wine adulterated with fuchsine and its colour passes to yellow on treatment with hydrochloric acid, but to bright red, if the wine was pure. The dyed skein treated with dilute cupric acetate, and dried at 100° becomes fine deep rose-violet if fuchsine is present, and of a lilac tinged with ash-grey if the wine is pure. This re-action is very sensitive.

Phytolacca.—(Portugal berries). The rose or lilac colourations of the re-actions *A*, *G*, and especially *C* of Table A are very sensitive.

Hollyhock.—(Althea rosea), much used. This substance imparts a peculiar flavour which in a few months becomes actually disagreeable, while the colouring matter itself rapidly precipitates.

Beetroot.—This is generally employed only to mask other adulterants. The lilac tint of re-action C of Table A, if the beetroot is fresh, and the yellowish colours due to alkalies, (re-actions *D. E.* and *F.* of Table A.) are very sensitive even with old decoctions.

Black Elder, Dwarf Elder.—The dwarf elder imparts a faintly turpentinous odour to the wines. The berries of both varieties are particularly used to communicate a special colour and flavour to port wine. The *teinte de Fismes*, which is largely used at Fismes, Paris, and elsewhere, is made by digesting 250 to 500 parts of elder berries, and 30 to 60 parts of alum, with 800 to 600 parts of water, and then submitting the mixture to pressure. M. Maumené reports having discovered as much as 4 to 7 grammes of alum per litre in wines adulterated with this substance. Sometimes (though rarely) the alum is replaced by tartaric acid. Wines adulterated with elder, yield a violet-blue lake (reaction H, table A). By comparison with pure wine the difference is very marked.

A piece of flannel, or skein of silk, mordanted with aluminium acetate, heated for some time in the suspected wine, then washed, and immersed in water made faintly alkaline with ammonia, becomes green if the wine is pure, but dark brown if black elder is present. Probably the same reaction occurs with dwarf elder.

Privet.—This is very seldom used. The general reactions, particularly *N* and *P* of Table A, must be relied on.

Myrtille, (Whortleberries).—Very seldom used, and only for the commonest wines. The principal characteristics are given in *L* (*c*), Table B. In wines suspected to be adulterated with this substance, citric acid should be sought for, its presence being one of the best indications of the adulteration.

Indigo. The re-actions *A* (*b*) and *B* (*b*) of Table B, are so sensitive that they are alone sufficient to characterise indigo. Wool or silk mordanted with aluminium acetate, heated with 20-40 c.c. of the suspected wine nearly to dryness, washed and then dipped into very dilute ammonia become dirty green if the wine be pure, but blue if indigo be present.

Indigo being often used to mask the too bright colours of cochineal and fuchsine, they should always be sought for after the removal of the indigo by clarification with albumin.

Indigo very rapidly separates from wines, and it may frequently be found in the lees, even when the wine itself gives no indication of its presence.

Substances other than those mentioned are occasionally employed for the adulteration of wines; among them are archil residues, sulpho-purpuric, and sulpho-alizaric acids, and their salts, but these have only recently been introduced, and are not yet seriously employed. Except in such cases as indigo and cochineal, it is only upon a series of concordant re-actions that the presence of an artificial colouring matter should be affirmed.

C. H. P.

PROSECUTIONS UNDER THE SALE OF FOOD AND DRUGS' ACT.

Mr. G. R. Toogood, grocer, was charged before the Stockton Borough Bench, with selling adulterated oatmeal. The case was before the Bench on a previous occasion, when it was stated that two samples of the oatmeal had been analysed by Messrs. Stead and Pattinson, of Newcastle, and found to contain 1½ and 1 per cent. of barley only respectively. Mr. Edger, of Newcastle, had analysed it, and showed that there was 25 per cent. of barley in it. The samples had been sent to Somerset House for analysis, and it was certified that they contained 15 per cent. of barley, and 4 per cent. respectively. The Bench fined defendant 2*l*., including costs.—Messrs. W. Webster and F. Heaton were also charged with largely adulterating oatmeal, and were fined 3*l*., including costs.—Mr. A. Holmes was also charged with the same offence, and was fined 1*l*., including costs.—The Co-operative Society were also charged with adulterating oatmeal with 25 per cent. of barley, and fined 1*l*. including costs.—Messrs. W. Jackson and Geo. Brown were also charged with selling oatmeal adulterated with 20 per cent. of barley, and were fined 1*l*., including costs.

Mr. John Hopley, provision merchant, of 340, Deansgate, appeared at the City Police-Court, Manchester, charged with having sold a quantity of lard which was not of the nature, substance, and quality of the article demanded by the purchaser. Mr. Talbot said the lard was bought by Mr. Rook from the defendant, and on being analysed it was found to be adulterated with 15 per cent. of water. There had been several cases under the 6th section of the Act, principally for the adulteration of milk. Convictions had been obtained, but a point had been raised, which caused the justices to to defer the present case until the return of the stipendiary magistrate. By the 25th section of the Act, it was enacted that if the defendant has a written warranty he shall be discharged from the prosecution. Mr. Cobbett would say that he had a written invoice in which the article was described as lard, and that such description being in writing would amount to a warranty under the statute. Careful reading of the Act, and subsequent reflection, led him (Mr. Talbot) to the conclusion that the Act intended there should be something more than a mere invoice; it required that there should be a guarantee in writing, distinctly setting forth the quality and description of the article in order to avoid conviction under the 25th section. The warranty of an invoice was of the very slightest character, and it ought to be more specific in order to come within the meaning of the section. If the magistrate ruled in favour of the defendant, the mere production of an invoice would render the Act a dead letter, which was a very undesirable state of things, as most business was carried on by means of invoices, and in every case the defendant could procure one very easily. In order to satisfy the Bench something more than a mere piece of paper with "lard" written upon it must be produced by the defendant. Mr. Estcourt, the city analyst, stated that on being analysed, the lard was found to be adulterated with 15 per cent. of water. There was no water naturally present in lard. Mr. Cobbett, in reply, said the defendant obtained his lard, butter, &c., from a Mr. Wm. Walker, who was a cheese factor and provision merchant in Liverpool. On July 3rd, the defendant bought from Mr. Walker, in Liverpool, amongst other things, four tins of lard for £2 15s. He received with them an invoice, on which was stated, "Bought from Wm. Walker, four tins of lard, &c." He asked Mr. Walker if the lard was pure, and he replied that it was. The lard was conveyed to Hopley's shop in Manchester, and was never touched after its arrival, until the purchase of a portion by Superintendent Rook. Upon those facts he (Mr. Cobbett) proposed to ask the Bench to dismiss the summons, and he did so upon these grounds: the section of the Act said "the article demanded by the purchaser." Mr. Rook asked for lard, and the defendant gave him what was to his belief lard, but which turned out to be lard and water. That, however, showed no guilty knowledge on the part of the defendant, but was rather a ground for proceedings against the vendor, Mr. Walker. The only material question was as to whether the invoice was such a warranty as was mentioned in the section. All the good authorities showed that no particular form of words was necessary for a written warranty; and though it might be said that there was no proof that the invoice had ever been seen by Mr. Walker, it had been decided that his name written or stamped on the bill-head was sufficient proof of his knowledge of its existence. The defendant was called, and bore out by his evidence Mr. Cobbett's statement. The case was adjourned.—Mr. Joseph Nuttall, provision dealer, of 213, Deansgate, was also summoned for having sold to Mr. Rook, lard adulterated with water to the extent of 15 per cent. The defendant said he bought the lard from a wholesale dealer, but he could not at the moment lay his hand on the invoice If the case were adjourned, he would produce it. This case was also postponed for a fortnight.—Mr. Samuel Gouldburn, 141, Ridgway Street, was charged with having sold to Mr. Rook, superintendent of nuisances, milk which was "not of the nature, substance, and quality of the article demanded by him," was fined 5*l*. and costs. The milk was adulterated with water to the extent of 9 per cent.—Mr. Edward Hayes, was fined 40s. and costs, for having on August 15th, sold a certain article of food, to wit, mustard, which was adulterated by the addition of 15 per cent. of starchy matter.—Mr. Charles Bostock and Mr. David Sewelson, were each fined 40s. and costs, for selling mustard which was not of the nature, substance, and quality of the article demanded. In the case of Mr. Bostock, the mustard was adulterated by the addition of starchy matter to the extent of 15 per cent., and in the case of Mr. Sewelson, the adulteration exceeded 25 per cent.

THE ANALYST.

"THE ANALYST," AND MR. J. ALFRED WANKLYN.

It will probably be noticed by our readers, that the name of Mr. J. A. Wanklyn, which has hitherto appeared as a member of the "Committee of Publication," of this journal does not appear on the cover of the present number.

It is with extreme reluctance that we feel compelled to explain the reason for the absence of Mr. Wanklyn's name, but that gentleman has left us no alternative.

In our issue of the 31st August, we felt it our duty to comment on a certain case of prosecution for the sale of adulterated butter in Scotland.

One of the chemists engaged in the case chose to feel affronted by our strictures, and instead of writing to us direct, addressed a letter to a Glasgow paper, in which he attacked *The Analyst*, in no measured terms.

A copy of the paper containing this letter was sent to us, and on September 30th we made a short reply to the writer, (Mr. Dittmar.)

Meantime, on September 12th, a meeting of "The Society of Public Analysts," was held at Glasgow, when the matter was mentioned, and Mr. J. A. Wanklyn, suggested the passing of a vote of censure on himself, and his colleagues on the "Committee of Publication."

The absurdity of this proposition was apparent to everybody, except Mr. Wanklyn, and consequently, it found no seconder.

The incident, so far as Mr. Dittmar was concerned, terminated by a decision being arrived at, to leave the matter in Mr. Wanklyn's hands, on the understanding that he (as he happened to be Chairman at the meeting), would see that some notice was inserted in *The Analyst*, with a view of soothing the feelings of the chemist, who fancied himself aggrieved.

A meeting of the "Committee of Publication" was held shortly afterwards, and Mr. Wanklyn was summoned in ordinary course; he, nevertheless, omitted to attend, and has not in any way communicated with *The Analyst* on the subject he was deputed to attend to.

Mr. Wanklyn, however, has not been idle. He has considered it consistent with his position as a member of a Committee, openly to attack his colleagues in the columns of a contemporary paper.

To show that we do Mr. Wanklyn no injustice, we reprint a letter bearing his signature, which appeared in the *Chemical News*, of the 6th inst.

We also print a letter addressed by the Editor of this paper to the *Chemical News*, to which letter, however, the *Chemical News*, has thought fit to refuse insertion.

In that journal of the 13th inst., Dr. Muter vindicated his own position against Mr. Wanklyn's charge, and in the same paper, on October 20th, Dr. Dupré, and Mr. Heisch (in a letter bearing date, October 9th), indignantly repudiated Mr. Wanklyn's imputation, that though members of the "Publication Committee," two other gentlemen were "alone responsible for the contents of the paper."

We think that this short explanation, taken in connection with the letters we print below, will be considered a sufficient justification for the omission from the list of the "Committee of Publication," of the name of Mr. J. Alfred Wanklyn.

COPY.] TO THE EDITOR OF THE "CHEMICAL NEWS."

SIR,—The subject of the recent attack on Professor Dittmar was brought before the notice of the Glasgow Meeting of the Public Analysts, and the attack was condemned by those present at the meeting. So decided was the expression of condemnation that a vote of censure on the Committee of Publication was even mentioned; but in place of so extreme a course (which, in my opinion, ought to have been followed) an *indirect* vote of censure was carried, the resolution being to the effect that before commentaries on adulteration-cases are inserted in *The Analyst* the chemists implicated should be communicated with.

I observe that the current number of *The Analyst* purports to give an account of the Glasgow Meeting of the Society, but does not in any way record the resolution passed at that meeting. I observe also an editorial commentary on Mr. Dittmar which is in direct opposition to the resolution passed by the meeting; and I take this opportunity of making known that the Society of Public Analysts have no real control over *The Analyst*, which is the property of Mr. Wigner and Dr. Muter, who alone are responsible for the contents of the paper.

I am, &c.,

October 2, 1876. J. ALFRED WANKLYN.

COPY.] TO THE EDITOR OF THE "CHEMICAL NEWS."

SIR,—Had Mr. Wanklyn paused to make a few enquiries before writing to you, he would not, I am sure, have dragged my name into this discussion, because he would have found that at the time *The Analyst* published the article and report which originally gave him offence, I was enjoying a ramble in Switzerland, and I can safely say never wasting a thought either on butter or Mr. Dittmar. In fact Mr. Wanklyn and myself have precisely the same amount of responsibility for the contents of *The Analyst* for September, viz., *that we were both members of the Committee of Publication, and that we each of us neglected our obligations as such, and stayed away from the meeting*, and therefore we ought to be the last to throw stones at those who did their duty by attending.

My position as one of the "registered proprietors" of the paper was simply taken to get the Society out of the difficulty that, not being corporate, they could not legally hold a copyright, and I will have much pleasure in handing over the position (involving, as it does, pecuniary responsibility) to any other member who may be public spirited enough to accept it. I trust Mr. Wanklyn will withdraw his remarks so far as I am personally concerned.

I am, &c.,

October 7*th*, 1876. JOHN MUTER.

COPY.] TO THE EDITOR OF THE "CHEMICAL NEWS."

SIR.—I have to ask for space in your columns to reply to a letter which appears over the signature of Mr. J. Alfred Wanklyn, in your issue of the 6th instant.

Mr. Wanklyn is pleased to speak of the "recent attack" made on Mr. Dittmar in *The Analyst*, which "attack," he says, was condemned by a recent meeting at Glasgow; further, that a vote of censure on the "Committee of Publication" was suggested, and, in Mr. Wanklyn's opinion, ought to have been passed.

The suggestion in question was made by Mr. Wanklyn, himself a member of the Committee he wished to censure, but it met with no support and fell to the ground.

Mr. Wanklyn complains that a certain resolution, which he states was passed, is not given in *The Analyst* report.

It need hardly be pointed out, that an ordinary report of a meeting does not, necessarily, include a copy of the actual minutes. For such information I beg to refer Mr. Wanklyn to the minute book of "The Society of Public Analysts."

To Mr. Wanklyn's assertion that a note in the last number of *The Analyst*, "is in direct opposition to the resolution passed at the meeting," I have to give an unqualified and emphatic denial.

Anybody capable of understanding plain English who reads the resolution, as quoted by Mr. Wanklyn, side by side with the article in *The Analyst*, commenting on Dr. Dittmar's published explanation, will, at once, see that the only "direct opposition" is that evidenced by the animus of Mr. Wanklyn's letter.

The concluding paragraph contains a statement which is so untrue and so clearly intented to be offensive, that it is my duty to contradict it absolutely.

Mr. Wanklyn says:—"The Society of Public Analysts has no real control over the Analyst," but that two individuals, whose names he gives, "alone are responsible for the contents of the paper."

This assertion is clear enough.

The answer shall be none the less unmistakeable.

A "Committee of Publication," consisting of six members of the council of "The Society of Public Analysts," has, from the first, been responsible for the contents of *The Analyst*, meetings of such committee have been held periodically, and I am in the position to affirm that in no case has any matter appeared in *The Analyst* which has not been previously submitted to, and approved by, the Committee.

If, when the article to which Mr. Wanklyn objects, was agreed to, Mr. Wanklyn was not there, it was, presumably, his own fault.

If he attended and voted against its insertion, and was in a minority, he should—as minorities always have to do—submit gracefully to the majority.

In any case, it would be well if, in future, Mr. Wanklyn would satisfy himself of the accuracy of his statements, before he allows them to appear in print.

Yours, &c.,

October 9, 1876. THE EDITOR OF "THE ANALYST."

COPY.] TO THE EDITOR OF THE "CHEMICAL NEWS."

SIR,—Referring to a letter which appears in your last number, signed by Mr. Wanklyn, we ask your permission to make a short statement, as follows:—

We beg to say that we are members of the "Committee of Publication" of *The Analyst*; that we consider we have devoted a fair amount of attention to our duties, that we have no wish to shirk our responsibility for anything that has appeared in *The Analyst*; and consequently, we are in a position to deny, as we hereby emphatically do, Mr. Wanklyn's assertion, that two other members of the "Committee of Publication" alone are responsible for the contents of the paper.

Whatever may be Mr. Wanklyn's view of the duty of any one holding office, we, for ourselves, can say that unless we felt ourselves both able and willing to perform our share of the duties of the Publication Committee of *The Analyst*, we would certainly not allow our names to be published as members of that Committee.

Yours, &c., CHAS. HEISCH,
LONDON, *Oct. 9th*, 1876. A. DUPRÉ.

ON THE SOLUTION OF DIFFICULTLY-SOLUBLE SUBSTANCES.

*By ALFRED H. ALLEN, F.C.S.

SOME years ago, in a letter to the *Chemical News*, (Vol. XXII., p. 57), I described a mode of effecting the solution of difficultly-soluble iron ores and slags, by heating them with strong hydrochloric acid in sealed tubes, and experience having shown the method to be extremely valuable in certain cases, I have thought it worth while to bring my results before the Society in the form of a paper.

In the analysis of minerals and metallurgical products containing iron, it is often necessary to determine whether that metal exists as a ferrous or a ferric compound. Of course, this is easy, provided the substance is readily decomposed by acids, but in the case of insoluble or difficultly-soluble minerals and slags, the problem is by no means easy of solution. Protracted boiling with acid is often very inconvenient, and sometimes useless; while any process of fusion almost necessarily involves more or less oxidation of ferrous compounds.

Mr. C. E. Avery (*Chemical News*, Vol. XIX., p. 270), has proposed to decompose silicates with a mixture of a fluoride and a mineral acid, and the same method in a somewhat modified form has been described by Messrs. Wilbur & Whittlesey (*Chemical News*, Vol. XXII., p. 2). These processes have a certain value of their own, but the use of fluorine compounds is not always convenient, though of course in some cases indispensable.

It might be anticipated that acids acting under pressure in sealed tubes would effect the decomposition of many refractory minerals, which resist ordinary methods of treatment, and this view is fully borne out by experience. This mode of treatment has the great advantage that it can be continued for any desired length of time, or discontinued and recommenced at will, and that the subsequent steps of the analysis can be performed after any interval of time most convenient to the operator.

The method of procedure I have been in the habit of adopting is simply as follows: A gramme of the finely powdered mineral or slag is placed in a piece of combustion tube carefully sealed at one end. From 20 to 30 c.c. of pure fuming hydrochloric acid are poured in, and the other end of the tube drawn out and carefully sealed in the blowpipe flame. The tube when sealed, should be about eight or ten inches in length. The proportion of acid used is such as to ensure a large excess; this prevents undue weakening by saturation of the acid, and has other obvious advantages.

*Read at a Meeting of "The Society of Public Analysts," at Glasgow, Sept. 12, 1876.

The tube is now ready for heating. In many cases, the mere heat of a water-bath is amply sufficient to ensure perfect decomposition. As fuming acid is employed, there is always considerably more than one atmosphere of pressure even at 100° C., but decomposition is in many cases greatly facilitated by use of a higher temperature. A very convenient bath for the purpose is formed by a saturated solution of nitrate of sodium, which boils at 120° C. In some cases, it is desirable to obtain a still higher temperature, in which case chloride of calcium can be conveniently employed. In all cases, however, I prefer to subject the tube to a temperature not exceeding 100° C. first of all. This enables the sealing to be tested, and perhaps causes some reduction of the internal pressure, owing to partial neutralization of the acid. In many cases the temperature of 100° C., is amply sufficient to effect perfect decomposition of the sample.

This is true of blast-furnace slag, all the varieties of which are readily decomposed at 100° C. In fact, blast-furnace slag rarely requires a sealed tube at all. The slag now obtained in England from the manufacture of spiegeleisen, contains from 30 to 40 per cent. of oxide of manganese, and is decomposed with such facility that if it be added in a powdered state to hot hydrochloric acid, the mixture will be converted, almost instantly, into a transparent jelly.

"Tap-cinder" and Bessemer-converter slag are far more refractory, and require somewhat prolonged treatment at an elevated temperature.

Basalt is readily and completely decomposed when heated with fuming hydrochloric acid in a sealed tube.

Titanic iron sand, if finely powdered, suffers perfect decomposition under the same treatment.

"Ore-furnace slag" from copper-smelting, is decomposed with difficulty.

Finely powdered burnt red brick, gives up some iron to the acid, but is very imperfectly decomposed.

Chrome-iron ore suffers very little change.

Tin-stone is partially dissolved, but I have not succeeded in effecting perfect solution.

A blank experiment showed that the acid had no sensible effect on the glass of the tube, even when heated in it to about 169° C. for five hours.

In all cases it is exceedingly easy to watch the progress of the decomposition. When complete, the tube can be left alone till it is convenient to proceed with the analysis. For the determination of the ferrous oxide, it is only necessary to open the tube, wash the contents into a basin, and titrate at once with standard bichromate.

The silica rarely separates in a gelatinous state.

It has been proposed to employ a mixture of three parts by weight of concentrated sulphuric acid, and one of water, for a similar purpose. Experiment shows that this is by no means a satisfactory modification, at least for the treatment of ferruginous silicates and similar materials, the sulphate of iron separated preventing further action on the undecomposed portions of the substance. In fact, I have succeeded in effecting complete decomposition by sulphuric acid in comparatively few cases.

It is evident that treatment in sealed tubes is not at all an advantageous plan of employing sulphuric acid, for unless the temperature be dangerously high, the vapour of

the acid exerts no great tension, and thus all the advantages of working under high pressure are lost, and one might as well use an ordinary bottle or corked tube at once.

But at very high temperatures sulphuric acid is able to effect decompositions with great facility, and, at a red heat, it is one of the most convenient and powerful re-agents we possess.

Of course "red-hot sulphuric acid" is employed in the form of acid sulphate of potassium. The sodium salt is often recommended, but it will not advantageously replace the potassium compound, as it decomposes at an inconveniently low temperature, and gives off much more sulphuric anhydride.

The acid sulphate should always be fused in the platinum crucible first of all, to drive off water and free acid, the sample being subsequently added.

It is desirable to test the purity of any fresh sample of "bisulphate" before using it. A quantity of the salt sold me by one of our principal operating chemists contained a considerable quantity of *silver*, an impurity doubtless dissolved from the vessel in which the salt had been fused by the manufacturer.

By fusion with acid sulphate of potassium, nearly all the above-mentioned refractory substances can be readily decomposed. Brick-dust leaves nothing but pure white silica, and the same is true of all clays.

Instead of treating ordinary soluble iron ores with hydrochloric acid, and having the unsatisfactory item of "silicious matter" to examine further, it is far better to fuse the ore with acid sulphate at once, by which means pure white *insoluble* silica is obtained, and all the other constituents pass into solution on treating the product of the fusion with acidulated water. In presence of pyrites or ferrous compounds it is best to add a crystal of nitre when the sample is placed in the crucible. The silica obtained is sometimes ochreous if too high a temperature has been employed, but it is readily purified by treatment with hydrochloric acid after pouring off the liquid. No evaporation to dryness to render the silica insoluble is requisite.

It is a pity that a re-agent so valuable and so widely applicable as the acid sulphate of potassium is not more commonly employed.

I have made a few experiments in another direction, and although the results possess merely a negative value, this appears a convenient occasion to place them on record.

It is well known that a hot solution of phosphoric acid readily acts on glass, and it occurred to me that the decomposing power would probably be greatly enhanced if *fused* meta-phosphoric acid were employed instead of a mere *solution*. This deduction was fully borne out by experiment. A fragment of window-glass about an inch square was treated at a low red heat in a platinum crucible with glacial phosphoric acid. In an hour or so it was decomposed nearly to the centre, and the change was accompanied by some very remarkable and characteristic appearances. With powdered glass the reaction was still more perfect, and there is no doubt that fusion with phosphoric acid might be employed as a means of decomposing silicates. The difficulty consists in the subsequent treatment of the resulting meta-phosphates. In practice, this presents such difficulties, that I have been compelled to abandon the idea of making the method useful, though it is possible that there are exceptional cases in which it might be made of service. The platinum crucible used for the fusion is seriously attacked.

ON THE COMPOSITION OF DIFFERENT KINDS OF COCOA.

By Charles Heisch, F.C.S.

It is well known, that different varieties of cocoa fetch very different prices; but as far as I am aware, no careful examination has been made to ascertain if these differences are caused by any difference in their composition regarded as articles of food, or if they be due solely to differences in flavour, which after all may be only matters of taste. In none of the published analysis of cocoa which I have seen, is any mention made of the kind of bean analysed, it is therefore not surprising that the results published vary very considerably. Thus, while in Dr. Hassall's book we are told that cocoa contains albuminoid matter 16·7 per cent.; in Dr. Parkes', Practical Hygiene, it is stated to contain from 13 to 18 per cent. of protein substance. In neither case is it mentioned, whether the bean was examined raw, or after roasting. Having through the kindness of a friend obtained samples of various cocoa beans, both raw and roasted, which he assured me were unmixed, I made a number of analyses of the roasted beans, which as far as food is concerned, are by far the most interesting, as I believe the raw bean is never employed. The results are shown in the following table. They are not so complete as I had hoped to make them, but they comprise the more important constituents, and as such analyses can be done only in the intervals of more pressing work, I prefer leaving the remaining less important constituents for a future communication. In the first column of the Table, is noted the proportion of husk in the different varieties. This difference appears to be mainly due to the husk in some kinds being much thicker than in others; in all cases these thick husks separate much more from the bean in the process of roasting, and can be taken off with much greater facility. The other estimations are made on the roasted bean after removal of the husk. The albuminoids are calculated from the total nitrogen found by combustion with soda lime, the nitrogen contained in the theobromine is thus included, but in the roasted bean this is so small that the difference is hardly worth consideration; hereafter, I hope to estimate the theobromine in the different varieties, as well as the starch, gum, cellulose, &c. It will be observed, that in none of the above samples do the albuminoid substances reach the amount mentioned by Hassall or Parkes, but as neither of them give the method by which the albuminoids were ascertained, no attempt can be made to account for the difference. The amount of these substances in Para, which is about the lowest priced variety, is, with one exception, the highest in the table, so that, viewed as an article of food it is superior to some of the more expensive kinds. The soluble ash consists to a great extent of phosphate of potash, the phosphoric acid in the portion insoluble in water being mostly if not entirely combined with magnesia.

		RESULT OF EXAMINATION OF ROASTED BEAN AFTER REMOVAL OF HUSK.								
	Per Centage of Husk.	Fat.	Nitrogen.	Albuminoid Substances.	Ash.	Ash Soluble in Water.	Ash Soluble in H Cl.	Phosphoric Acid in Ash, calculated as H_3PO_4.	Moisture.	Starch, Gum, Cellulose, &c.
Caracas ...	13·8	48·4	1·76	11·14	3·95	2·15	1·80	1·54	4·32	32·19
*Trinidad...	15·5	49·4	1·76	11·14	2·80	·9	1·90	·93	3·84	32·82
Surinam ...	15·5	54·4	1·76	11·14	2·35	·80	1·55	1·23	3·76	28·35
Guayaquil.	11·5	49·8	2·06	13·03	3·50	1·75	1·75	1·87	4·14	30·47
Grenada ...	14·6	45·6	1·96	12·40	2·40	·60	1·80	1·35	3·90	35·70
Bahia	9·6	50·3	1·17	7·40	2·60	·90	1·70	1·26	4·40	35·30
Cuba	12·0	45·3	1·37	8·67	2·90	·95	1·95	1·13	3·72	39·41
Para	8·5	54·0	2·00	12·66	3·05	1·40	1·65	1·00	3·96	26·33

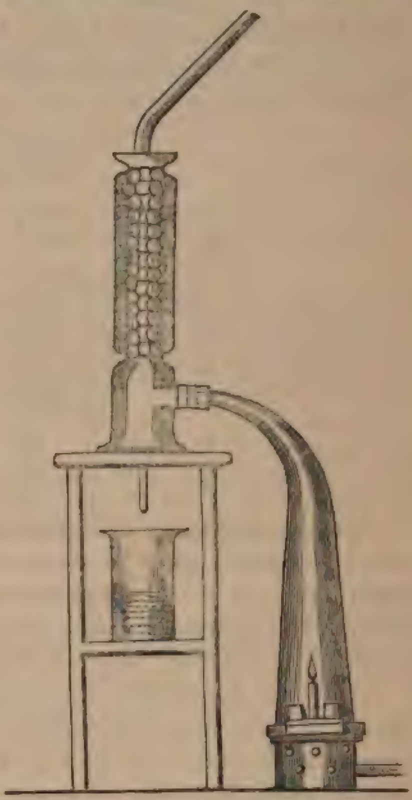
* I am inclined to think that the Trinidad sample was not of the finest quality.

ON THE PRODUCTION OF SULPHURIC ACID BY THE COMBUSTION OF COAL GAS, &c.,

By W. C. Young, F.C.S.

It is the belief of many eminent gas engineers, that the sulphur compounds in coal gas are converted into sulphurous acid by combustion in burners used for lighting purposes, and they are confirmed in their belief by the published opinions of several eminent chemists. The experiments, which are the subject of this paper, were made with the purpose of determining the amount of sulphurous and sulphuric acid respectively, that is produced by burning coal gas in different burners, and were commenced nearly two years ago, their progress having been interrupted until lately.

The apparatus in use at the Official Testing Offices for the estimation of sulphur in gas, is that known as the Gas Referees' apparatus, (*see Fig.*,) and is of the following description.



The gas is burnt in a small Bunsen burner with steatite top, which is mounted on a short cylindrical stand, perforated with holes for the admission of air, and having on its upper surface a deep circular channel, to receive the wide end of a glass trumpet-tube, on the top of the stand; between the narrow stem of the burner, and the surrounding glass trumpet-tube, are placed pieces of commercial sesqui-carbonate of ammonia, weighing in all about two ounces. The products, both of the combustion of the gas, and of the gradual volatilization of the ammonia salt, go upwards through the trumpet-tube into a vertical glass cylinder packed with glass balls to break up the current, and promote condensation. From the top of the cylinder there proceeds a long glass tube to increase the draught and form an exit for the uncondensable gases. In the bottom of the cylinder is fixed a small glass tube, through which the liquid formed drops into a beaker placed beneath.

The condensed liquor contains the sulphur as sulphate of ammonia.

It is supposed by some that the complete oxidation of the sulphur is effected by nitric acid, formed by the oxidation of the ammonia vapours passing over the flame. The following experiments prove that this is not so, and that the Bunsen flame is sufficient alone to complete the oxidation.

The gas was burnt in a gas referees' apparatus having no carbonate of ammonia round the burner. On the top of the glass balls a few crystals of pure carbonate of soda were placed, so that the interior of the cylinder was kept alkaline, and the absorption of

the acid vapours assured. Care was taken that no ammoniacal vapour was present. Result:—

	Apparatus with $(NH_4)_2CO_3$ round burner. Grains S in 100 c. ft.	Apparatus with Na_2Co_3 on top of cylinder. Grains S in 100 c. ft.
1.	9.27	9.65
2.	10.30	10.60
3.	9.40	9.75
4.	11.20	11.60

Having found that the modified apparatus gave as perfect results as the original, the Bunsen was replaced by a common fish-tail and other burners successively, and the gas burnt at the rate of about 1.25 c. ft. per hour (that being as much as the draft through the apparatus would permit). The condensed liquor was then made up to a known bulk, a portion boiled with hydrochloric acid, so as to expel any sulphurous acid that might be present, and the S estimated as Ba SO_4. Another portion was acidified with nitric acid and set aside for 24 hours, and the S estimated as before; the difference between the two estimations being ascribed to sulphurous acid. The results are stated in grains of sulphur per 100 c. ft. of gas.

FISH TAIL BURNER.

	As H_2SO_4.	As SO_2.	S by Referees' app.
1.	11·1	·2	10·9
2.	12·1	·3	11·7
3.	9·3	·0	9·1

LONDON ARGAND BURNER.

1.	12·7	·4	12·6
2.	11·3	·2	11·1
3.	11·4	·4	11·3

COMMON IRON ARGAND.

1.	8·5	·0	8·5
2.	9·1	·2	9·0
3.	10·3	·4	10·1

In these experiments the conditions were favorable to the production of sulphurous acid, as the supply of air to the burner was little more than sufficient to produce a steady flame, and of course would be less than when in ordinary use. As will be seen, however, the oxidation was as complete as in the Bunsen burner, and but a mere trace of sulphurous acid was obtained in either case.

There can be no doubt, that the notion that sulphurous acid was the principal product of the combustion of sulphur compounds in coal gas, arose from the statements to be found in most text-books, that when sulphur or sulphuretted hydrogen is burnt with an excess of oxygen, the product is sulphurous acid. When sulphur is burnt in *dry* oxygen, sulphurous acid alone is produced of course, but in *moist* oxygen, sulphuric acid will be found in addition. The statement is insufficient as regards sulphuretted hydrogen, as sulphuric acid may always be found in the product of its combustion.

In order to see how far the simultaneous production of water during the combustion of sulphur compounds affected the oxidation of the sulphur present, I burnt sulphuretted hydrogen, a mixture of hydrogen and sulphuretted hydrogen, and coal gas charged with bisulphide of carbon, respectively, under a trumpet-tube fixed to a vertical cylinder, 2 feet high and 4 inches in diameter—about twice as large as the condenser in the Referees' sulphur apparatus—differing in shape from the latter, in having two necks at

the top. In one of these necks was fitted a separating funnel, through which a strong solution of pure caustic soda was slowly run on to the glass balls, with which the interior of the cylinder was filled; to the other was fixed an eduction tube. In the bottom of the cylinder was fitted a tube through which the liquid ran into a vessel beneath. In this way a large alkaline surface was obtained, which was being constantly renewed from the stoppered funnel.

One portion of the liquor obtained was boiled with H Cl, another diluted very considerably with water, acidified with HNO_3, and set aside for 24 hours; the S estimated in both as Ba SO_4.

The H_2S was burnt at as low a rate as possible, and the result showed that very nearly 1 per cent. of the S was converted into H_2SO_4.

A mixture of H and H_2S containing 4 per cent. of the latter, produced no sulphurous acid during its combustion.

The coal gas was charged with bisulphide of carbon, by passing it over a solution of the latter in olive oil. In the first experiment, the gas was burnt at the rate of ·5 c. ft. per hour, the result showing a total of sulphur amounting to 444 grs. per 100 c. ft., of which 422 grs. (95 per cent.) had been converted into H_2 SO_4.

In a second experiment the solution of bisulphide used was very much stronger, and the gas was burnt at the rate of ·2 c. ft. per hour. The result was as follows:—Total sulphur, 1644 grs. per 100 c. ft., of which 1260 (or 76·7 per cent.) was converted into H_2 SO_4.

It is evident from these experiments that the presence of aqueous vapour, or, its simultaneous production, does very materially effect the oxidation of sulphur, and that, practically, the sole product of the oxidation of the sulphur in coal gas, is sulphuric acid, even if that impurity be present in very large quantities.

ON A SIMPLE METHOD OF TAKING THE GRAVITIES OF FAT AT HIGH TEMPERATURES.*

By G. W. Wigner, F.C.S.

Some two months since, I published in *The Analyst*, a short note, on the use of the well known specific gravity bubbles, for the purpose of taking the specific gravities of melted fats at high temperatures.

The method seemed to offer several advantages, amongst others it is easy to work on a very small quantity of the pure fat, and a reading of temperature which can be made with considerable accuracy, is substituted for a weighing at a high temperature, which is, to say the least, a difficult and delicate operation.

The process itself contains one element of error. The bubble, consists of a hollow glass bead, with a tail or shank. The definite adjustment of the bubble to the required specific gravity is made by grinding this shank, and testing this bubble in a solution which is of the required specific gravity, at a temperature of 60° F. When, however, the bubbles are used in hot fats, the expansion of the air sensibly alters the shape and dimensions of the bubble. The consequence is, that the gravity of the bubble determined at 60°, does not represent the actual gravity of the fat at the temperature at which the experiment is made, but requires a certain correction.

* Read at a meeting of the Society of Public Analysts, at Burlington House, on June 14th, 1876.

The results, however, are perfectly regular and concordant, and this slight correction is therefore easily applied; while the figures obtained are so reliable that many samples of butter need no further examination. I am convinced, that when it is desired to take the gravities of liquid fats at temperatures higher than 100°, the bubbles will be found to give much more accurate results than can be obtained by weighing.

The mode of manipulation which I adopt is as follows:—

The fats to be tested, are melted and kept for some time (say half-an-hour) at a temperature considerably in excess of their melting point (say 180°) so as to ensure perfect fusion and uniform mixture. A portion of each is poured into a test tube, of about 5-in. by ⅝-in. size, which is filled within an inch of the top. These test tubes are fitted with corks having a notch in the side to allow for the expansion and contraction. The corks are bored with holes, through which are inserted small pieces of glass rod with rounded ends, long enough to dip ½-in. or more below the surface of the fat. After the bubbles are put into the fat in the tubes, these corks holding the glass rods are inserted, and the bubble is thus forced entirely below the surface of the fat, and therefore is free from the slight surface adhesion which would otherwise exist.

The test tubes are then dropped into holes in a sheet of copper which supports them by their flanges, and are immersed in a beaker of water, at a temperature of say 100° F. This beaker is in turn supported by a tin or copper ring in another larger beaker containing water, at the same temperature, and the whole arrangement is then put on a small sand bath. The burner is so arranged as to raise the heat very slowly, 1° F. per minute is the greatest rate of increase which must be used under any circumstances.

As the temperature rises, the bubbles will be seen to detach themselves from the ends of the glass rods. They will fall at first very slowly, but still there will be no difficulty in observing the time at which the first line of separation appears, within twenty seconds.

Following this procedure, I have worked with bubbles of various specific gravities, but the following results show those which I consider the most generally suitable. I took a sample of ordinary butter, and separated the pure fat in the usual way. I weighed the melted fat according to Muter's method at 100°, and 135° Faht.

The results, all calculated from actual weighings in a *glass* bottle, (no allowance being made for the expansion of the bottle) were as follows:

Specific Gravity at 100° F ... . Compared with water at 60° F	907·2
Corresponding to "Actual Density," at 100° F ... Compared with water at 100° F	912·1
Specific Gravity at 135° F ... ... Compared with water at 60° F	895·2
Corresponding to "Actual Density," at 135° F ... Compared with water at 135° F	906·7

A bubble, the specific gravity of which (as determined by a mixture of spirit and water) was 896·, was tested in this Fat and sank at 135°. The indication given is therefore 896·, as against a real specific gravity of 895·2 at 135° F, which corresponds to an error of 2° F in temperature of the specific gravity bottle at the time of taking the weight.

I took some of the same butter fat and mixed it with lard fat in different proportions. The fats were measured when in a melted state instead of being weighed, and were successively increased by one sixth. So that No. 1 is pure lard. No. 2 five-sixths lard, one-sixth butter, and No. 7, pure butter.

These mixed fats were each tested with five bubbles of the following gravities at 60° F.

A and B	...	...	...	...	889·0
C and D	...	...	...	..	888·0
E	...	...	...	...	896·0

The following table shows the "actual densities" of these fats at 100° F, and the temperatures at which the bubbles were found by actual experiment to sink.

Number.	Percentage of Butter.	Actual Density.	Temperature at which the bubbles sank. Degrees Faht.				
			A	B	C	D	E
1	0	905·3	127	126	129	129	114
2	16	906·2	131	131	132	132	117
3	33	907·1	136	136	137	137	122
4	50	908·6	139	139	141	140	124
5	66	910·8	141	141	142	143	128
6	83	911·2	145	145	146	145	132
7	100	912·1	146	147	149	148	135

From these results it follows, that in a sample of so called butter having an actual density of 911° (the density, which has been fixed by Muter as that above which, samples may be safely passed), beads will sink as follows:—

Sp. gr. of Beads	...	...	...	889·0	896·0
Temperature	...	...	...	145° F	132° F.

If the bead sinks at any temperature lower than these, the butter will need further examination by actual determination of the percentage of fatty acids. But as a guide to the gravity it may be assumed that a difference of one degree in the sinking temperature indicates ·30 actual density, equal to about ·35 per cent. of fatty acids, and nearly 5 per cent. of foreign fats.

CORRESPONDENCE.

BUTTER ANALYSIS.

To the Editor of the "Analyst."

Sir,—In answer to Dr. Muter's letter on the above subject, in the September number of *The Analyst*, will you please give insertion to the following remarks:—

In June, 1874, we published our book on Butter Analysis, in which we showed, that the detection of foreign fats in butter by chemical means was a comparatively easy matter, and for about two years, Dr. Muter allowed us to get the credit of having first arrived at the complete solution of the much discussed butter question.

Dr. Muter, now refers to pages 586-7 of the *Food Journal*, for 1870. The passages he wishes to point out are the following: "The really exact mode of detecting tallow in butter, can only be based on a proper separation and estimation of the various fatty acids. This is an operation which necessitates practice, and is also tedious." Anyone with a moderate acquaintance with the subject might have said as much.

On page 587, we get however, something more definite, Dr. Muter, says: "want of space forbids any description of the mode adopted in separating and estimating the fatty acids, but we shall soon be able to recur to the subject, when a process will be detailed, which is found most workable, and which is a modification of Heintz's method." Dr. Muter, never recurred to the subject, and it is left to the reader to decide, whether the method had actually been worked out by Dr. Muter, or whether he only *hoped* to get at one, by following Heintz's method. Be that as it may, he never said one word about it until April or May, 1876.

Yours, &c., OTTO HEHNER.
ARTHUR ANGELL.

DETECTION OF FUCHSINE IN WINES.

By E. Jacquemin.

Bull. Soc. Chim. [2] xxvi. 68-71.

The following processes are given :—

1. *By the direct dyeing of gun-cotton.* A wad of gun cotton is heated in about 20 c.c. of the wine, then withdrawn and washed with water. Fuchsine, and archil (which is sometimes used to increase the colour of wine), both dye it, whereas the natural colouring matter of the wine does not. The two former may be differentiated by moistening the dyed wad with ammonia, which changes the archil to violet, and bleaches, though slowly, the fuchsine.

Gun-cotton, which is undergoing change, is more efficacious than that which is new and pure.

Other substances used for artificially colouring wines fix themselves upon gun cotton sufficiently well for conclusions to be drawn as to their nature, by the changes which they undergo on treatment with ammonia.

2. *By the direct dyeing of wool.* Wool is scarcely affected by the natural colouring matters of wines, but is dyed by fuchsine and archil. About 100 c.c. are evaporated till the alcohol is removed. A piece of white embroidering wool is then immersed into it, and the evaporation continued till the bulk is reduced one-half, when the wool is withdrawn and thoroughly washed. The tints of fuchsine and archil are slightly altered by the trace of natural colouring matter from the wine, but, on treatment with ammonia, the last-mentioned changes to brown, whilst the fuchsine is rapidly dissolved, and the ammoniacal solution becomes red on acidification. The archil becomes violet, as does also the ammonia into which it is dipped.

3. *By dyeing wool by means of ammoniacal fuchsine.* The alcohol is evaporated from one or two hundred c.c. of the wine, the remainder made alkaline with ammonia, and then shaken with ether. The ethereal solution is evaporated on a piece of white embroidering wool as before, which then becomes dyed red, as the evaporation proceeds. The destruction of this colour by ammonia, and its reproduction by acetic acid, leaves no doubt as to the nature of the colouring matter. If archil is present the ethereal solution is red.

C. H. P.

CAPSAICIN, THE ACTIVE PRINCIPLE OF CAPSICUM FRUITS.

[*Pharmaceut. Journal, No.* 315, 1876, *p.* 21.]

Mr. C. F. Thresh appears to have succeeded in isolating the pungent principle of cayenne.

The first step is to obtain the oily fluid named by Buchheim "capsicol," by treating the powdered fruit with ether, distilling off the ether, dissolving the residual extract in boiling caustic alcoholic ley, diluting with water and precipitating with barium chloride ; this precipitate is washed, dried, and treated with ether, and upon evaporation the oily capsicol is obtained, which may be purified by a repetition of the process.

Erom capsicol ; capsaicin may be obtained in two ways—

(*a*) Capsicol is dissolved in twice its volume of almond oil, and agitated with three successive portions of proof spirit, the alcoholic solution is separated, and upon evaporation leaves a red-brown fatty residue, which when dissolved in dilute solution of potash, and treated with dilute ammonia, deposits, on standing pearly white crystals of Capsaicin.

(*b*) The capsicol is dissolved in dilute potash, precipitated by ammonium chloride, the coloured precipitate re-dissolved in potash, and re-precipitated at 120° F by ammonium chloride in excess—in a few days an abundant crop of capsaicin crystals will be the result.

Capsaicin may also be obtained by dialysing the tincture of capsicum—the dialysed solution has an acid reaction.

Capsaicin is powerfully pungent, the most minute portion, if volatilised, causing severe fits of coughing. It dissolves slightly in cold water, more readily in boiling water, a portion at that temperature becoming volatilised, and causing long continued fits of sneezing, the excess of what is taken up by the water melts and floats on the surface of the fluid as a colourless oil. The hot solution precipitated by the addition of a strong acid deposits crystals. Capsaicin dissolves readily in proof spirit, giving, when not too dilute, white precipitates with barium and calcium chlorides, both soluble in ether. Silver nitrate gives a precipitate which dissolves in dilute ammonia, and the solution when boiled darkens in colour and deposits a curdy brown-black precipitate. Capsaicin is volatilised slowly at 212° F., and may be obtained as a sublimate of fatty globules, if mixed with water and distilled. The distillate has a distinctly pungent taste.

A. W. B.

CAPSAICIN.

By I. C. Thresh, F.C.S.

(*Pharmaceut. Journal*, [3], 326, *page* 259.)

Mr. Thresh now finds that the red waxey substance from whence capsaicin may be separated, is easily and cheaply obtained by the use of Petroleum as a solvent; the residue may be dissolved in dilute solution of potash and carbonic anhydride passed through the solution; the capsaicin is immediately precipitated in minute crystals. *The Action of Heat.* Capsaicin melts at 138° F., volatilises, unchanged, at 240° F., and at 248° F. becomes brownish black. The specific gravity of the pure substance is 1060.

It is soluble easily in alcohol, rectified and proof spirit, ether, amylic alcohol, acetic ether, acetic acid, benzine, the fixed oils, and solution of the alkalies; it dissolves slowly in turpentine and carbonic bi-sulphide. Petroleum does not dissolve it readily, but its solvent powers are increased by the presence of the red fat.

It is totally insoluble in solutions of the carbonates of the fixed alkalies, and ammonia.

A. W. B.

AVA, or, KAVA KAVA.

Pharm. Journal, [3] *No.* 321, *p.* 149.

Ava is the local name of the *piper methysticum*, a shrub, about 6 ft. high, cultivated in Viti, Tahiti, Hawaii, the Society and Tongan Islands. The root and base of the stem have been introduced into France, as a remedy for gonorrhea, and it will probably be tried in this country ere long.

According to M. Cuzent, the root contains an essential oil of a pale yellow colour, 2 per cent. of an acrid resin, and about 1 per cent. of a neutral crystalline principle called

kavahin, or methysticin, which is obtained in acicular crystals by crystallisation, from a concentrated tincture. Kavahin differs from piperin, and cubebin, in being coloured red by hydrochloric acid, the red colour fading on exposure to air into a bright yellow, and in being coloured by strong sulphuric acid, a purplish violet colour, which passes into green. The root contains also nearly half its weight of starch.

Since neither kavahin, nor the resin are soluble in water, and the infusion produces the characteristic effects of the drug, it would appear probable, that the active principle is yet to be separated; kava in small doses acts as a stimulant and tonic, in large, it produces a silent and drowsy intoxication, and if used long for this purpose appears to cause a peculiar kind of skin disease. A. W. B.

THE ACONITE ALKALOIDS.

By Dr. C. R. A. Wright, D. Sc., Lond.

Pharm. Journal, [3] *No.* 326, *p.* 286.

Dr. C. R. A. Wright, read a very important paper on the aconite alkaloids at the recent Pharmaceutical Conference, in which he suggests, and indeed almost proves, that the different alkaloids named napelline, lycoctonine, acolyctine, pseudoaconitine, &c., are really different alteration products of some one parent alkaloid common to all the species of aconites; the practice of using mineral acid to percolate the ground root, and the subsequent boiling down of the acid extract, causing alteration in the alkaloid present. On the other hand, the use of tartaric acid, and a low temperature as recommended by Duquesnel, appears from the crystallisable nature of the base thus obtained, to produce less change or perhaps none at all.

After detailing numerous experiments, which all support the author's assertion, that aconitum napellus, contains only one crystallisable physiologically active base, possessing the formula $C_{33}\,H_{43}\,NO_{12}$; the author draws the following practical conclusions:—

1. When *A. Napellus* is treated by Duquesnel's process, there are extracted (*a.*) a crystallisable alkaloid insoluble in potassium carbonate solution, which is difficult to purify by simple crystallisation from ether, but which after conversion into a crystalline salt and regeneration therefrom gives numbers agreeing with the formula $C_{33}\,H_{43}\,NO_{12}$, and (*b*) a second alkaloid or mixture of bases which does not crystallize itself, and does not yield crystalline salts, and which has a lower molecular weight than aconitine, and contains more carbon and hydrogen. (*c.*) A non-crystalline base or mixture of bases, soluble in dilute potassium carbonate solution and possibly identical with (*b*).

2. The formula assigned to "crystallizable aconitine," viz.: $C_{27}\,H_{40}\,NO_{10}$, by Duquesnel who first isolated the substance in a state of moderate purity does not exactly represent the composition of the pure base, the difference in Duquesnel's results being apparently due to imperfect purity of the substance isolated and examined by him.

3. The amorphous substance examined by Von. Planta, to which he assigned the formula $C_{30}\,H_{47}\,NO_7$, was probably a mixture of aconitine more or less altered during the extractive process, and the amorphous bases above-mentioned; whether this amorphous body pre-exists in the fresh roots, or whether it is formed during the extraction process, it is at present impossible to say. Probably "napelline" is identical with, or closely allied to, this body.

4. Although when alcoholic hydrochloric acid is used to extract the alkaloides from *A Napellus*, a considerable quantity of a comparatively inert base appears to be formed, and largely dilutes the crystalline nitrate of the active base, $C_{33}\ H_{43}\ NO_{12}$, yet no appreciable amount of this substance appears to be produced by Duquesnel's tartaric acid method.

5. The method that ought to be adopted for the preparation of a pharmaceutical product of constant composition and properties is: 1st. Percolation by alcoholic tartaric acid and evaporation, to a small bulk of the percolate, at as low a temperature as possible (probably in a vacuum pan would be best.) 2nd. Crystallisation from ether of the base, separated by sodium or potassium carbonate from the aqueous solutions of the extracts. 3rd. Further purification by conversion into a crystalline salt, for which purpose the hydrobromide is well fitted. The base obtained in this way is a simple body, expressed by the formula $C_{33}\ H_{43}\ NO_{12}$ in a state of great purity, and possessing high physiological activity.

A. W. B.

NOTES ON THE DETERMINATION OF SULPHUR IN COAL.

By W. Morgan, Ph. D.

Some time ago I had occasion to determine the amount of sulphur in a sample *A* of coal which was submitted to me for analysis. Another sample, *B*, was also taken from the same parcel and delivered to another chemist, the coal having been previously pulverised finely and well mixed. On comparing the results *B* was one per cent. higher in sulphur than *A*. This difference in results led me to make the following experiments in order to test the various methods employed, viz.:—

Oxidation of the sulphur by H Cl, K Cl O_3, & H NO_3

Ditto by fusion with K NO_3, $Na_2\ CO_3$ & Na Cl.

Oxidation by combustion in oxygen and passing the products into a bulbed U tube containing H Cl and bromine, as described by Sauer, Fresenius (Leitosch Anal., Ch., Vol 12, page 32.)

For anthracite coals I employ a short tube about 9 inches long, one end drawn out and bent so as to pass down into a chloride of calcium tube, conducted into a beaker containing water, the other end connected with the oxygen gas holder. With bituminous coals I find it is better to take a larger tube and keep the boat back in it, so as to let the volatile matters condense in the cool part of the tube, and they may afterwards be carefully burned off. I would strongly urge the importance of rinsing the tube out thoroughly, otherwise the results will be below the truth. The rinsings and contents are afterwards transferred to a beaker, heated to expel excess of bromine, filtered if necessary, and afterwards precipitated by barium chloride treated in the usual manner.

As a rule the combustion of 0·5 to 0·75 anthracite coal takes about three-quarters to one hour; bituminous coal usually takes less time.

The great advantage of this method is that the residual ash in the boat may be weighed and further examined for calcium sulphate, which is a very important point, and generally overlooked, thereby leading to erroneous results if present in large quantity. For instance, a sample of coal I examined gave the following—

Carbon	73·21	per cent.
Hydrogen	5·24	„
Oxygen and Nitrogen	9·92	„
Sulphur	1·83	„
Ash	9·80	„
	100·00	

The sulphur was determined by combustion in oxygen, the ash on testing with H Cl and filtering gave a precipitate of Ba SO_4, equal to 0·67 per cent. on the coal taken. Now by the ordinary fusion methods the analysis would have been somewhat as follows—

Carbon	73·21	per cent.
Hydrogen	5·24	"
Oxygen and Nitrogen	9·25	"
Sulphur	2·50	"
Ash	9·80	"
	100·00	

The 0·67 being given twice over, viz., as sulphur and in the ash.

I take it that all that is required and understood by the determination of sulphur is how much is removable by the burning of the sample of coal, the sulphur present as sulphate of lime remains unchanged.

OXIDATION BY THE FUSION METHOD.

A *Sample.*

	Ba. SO_4	
1.—9 gr. Fusion Mixture + 4 gr. Na. Cl. dissolved, acidulated, not filtered, gave	0·0473	grammes
2.—Quantities, &c., as in 1, but filtered	0·0458	"
3.—Ditto as in 1, but heated for 25 minutes over Bunser gas burner	0·0538	"
4.—Ditto as in 3, but further heated for 15 minutes over table blowpipe ...	0·0623	"
5.—Precisely the same as in 4	0·0648	"
6.—0·5 gr. Coal with the same quantity of materials, and heated for the same length of time as 4 and 5	0·1278	"
7.—Same materials and quantities as in 6, but heated as 3	0·1198	"
8.—0·5850 gr. Coal burned in Oxygen, bend of the tube not rinsed out ...	0·0568	"
9.—0·5454 gr. ditto ditto bend of tube thoroughly rinsed out into beaker	0·0688	"

B *Sample.*

10.—0·5 gr. Coal, materials and heating as in 4 and 5	0·1313	"
11.—Ditto ditto ditto as in 3 and 7	0·1188	"
12.—0·5 gr. Coal, treated as 9	0·0598	"
13.—0·5 gr. Coal, 9 gr. Fusion Mixture + 4 gr. Na. Cl, heated 30 minutes over Bunser gas burner, and 30 minutes in a muffle furnace*	0·1278	"
14.—Fusion Mixture and Salt heated during and for the same length of time as in 13	0·0628	"
15.—0·5 gr. Coal, treated as in 9 and 12	0·0638	"

In all the Fusions the platinum crucibles were covered during the whole time.

* Muffle heated by Coal.

SUMMARY OF RESULTS.

.—0·1278 — 0·0635 (mean of 4 and 5,)	= 0·0643 Ba SO_4 ...	= 1·76	per cent. Sulphur.
7.—0·1198 — 0·0538 (3)	= 0·0660 " ...	= 1·81	" "
8.—Results too low, showing necessity of rinsing out the tube	...	= 1·33	" "
9.—Tube thoroughly rinsed out	...	= 1·73	" "
10.—0·1313 — 0·0635 (mean of 4 and 5,)	= 0·0678 ...	= 1·86	" "
11.—0·1188 — 0·0538 (3)	= 0·0650 ...	= 1·78	" "
12.—	...	= 1·64	" "
13.—0·1278 — 0·0628 (14)	= 0·0650 ...	= 1·78	" "
14.	...	= 1·75	" "

Oxidation by treating with H Cl, K ClO_3, and HNO_3, the usual precautions being adopted with regard to removal of chlorine and nitric acid.

15 gave	1·30	per cent. Sulphur.
16 "	1·28	" "
17 "	1·24	" "
18 "	1·29	" "

These last mentioned results conclusively prove that the oxidation in the humid way does not give accurate results in determining sulphur in coal, I have also found that treating coal with hot water alone, in order to test for sulphates is extremely fallacious.

PROSECUTIONS UNDER THE SALE OF FOOD AND DRUGS' ACT.

At the Kirkdale Petty Sessions, two informations were heard against milk dealers for adulteration. In the first case Henry Barton, was charged with having sold half a pint of adulterated milk. Mr. Superintendent Martin said that on the 13th of September he met a shandry which was being driven by the defendant's son in Rice Lane, Walton, and purchased from him half a pint, which he afterwards submitted to Dr. Campbell Brown, the county analyst. He had since received from Dr. Brown, a certificate stating that the milk contained 2·9 per cent. of fat, 7·1 per cent. of other solids, and that upwards of 25 parts of water had been added to every hundred parts of milk. The defendant was fined £5 and costs, or two months' imprisonment in default. Matthias Clarkson, was charged with a similar offence. On the 13th of September, Mr. Superintendent Martin visited the milkhouse of the defendant and bought half a pint of milk, which he submitted to Dr. Campbell Brown, whose certificate showed the following result: 2·93 per cent. of fat, 7·7 per cent. of other solids, and 17 parts of water had been added to every hundred parts of otherwise rich milk. The defendant was fined £5 and costs, and Mr. Neilson said if those cases again occurred the fines would be doubled.

Southwark.—Henry James, a cheesemonger in a small way in business at 21, Manor road, Bermondsey, was summoned by order of the Bermondsey Vestry for selling as pure butter a mixture containing 67 per cent. of foreign matter. Mr. Doman, the inspector appointed for the purpose of carrying out this act of parliament, said that on the 11th ult. he caused three quarters of a pound of butter to be purchased at defendant's shop, for which he paid 1s. He took a portion produced to Dr. Muter to be analysed, and the result of that was Dr. Muter's certificate, showing 67 parts out of 100 were not butter. The defendant said he sold it as he purchased it. He believed it to be genuine butter. Mr. Benson directed him to be sworn, when he produced an invoice showing that he purchased the butter of Mr. G. S. Rayment, 265, Blue Anchor road, on the 6th ult. Since he had received the summons he had seen Mr. Rayment about it, and he told him there was nothing injurious to health. Mr. Benson said it appeared to him to be a very impudent fraud, and the sooner it was put a stop to the better. He should like to know where such stuff was manufactured. Mr. Wells, a cheesemonger, in the Lower Marsh, Lambeth, who happened to be in court, informed his worship that it was manufactured abroad, and sent over to this country packed in cases. Mr. Benson told defendant he was not excused from the penalties, but to give the vestry an opportunity of proceeding against Mr. Rayment he should adjourn the case until Tuesday next. Henry Bowhead, grocer, 54, Tranton street, Bermondsey, was summoned for selling as pure coffee, a mixture containing 75 per cent. of chicory. Mr. Doman said that on the same day he caused a quater of a pound of shilling coffee to be purchased at defendant's shop. He took it to Dr. Muter who certified that it contained 75 per cent. of chicory. The defendant said he was not at home at the time or he should not have sold it; as coffee could not be purchased for a shilling a pound. Mr. Benson told him it was sold as coffee. It was his duty to tell the customer at the time they purchased a cheap coffee that it contained chicory. Mr. Safford, chief clerk, here intimated that defendant was liable to a penalty of £100 under the Excise laws.—Mr. Benson fined defendant 20s. and 12s. costs, telling him it would be fortunate for him if the Excise did not take proceedings against him.

Worship Street.—Mr. Walker, vestry clerk of the parish of St. Leonard, Shoreditch, attended to support three summonses, taken out by the parish authorities against John Goldborough, of 193, New North road, Hoxton, against William Baily, 41, Park street, Hoxton, and against James Jackson, 3 Queen street, Hoxton, for selling milk and water as milk.—The defendants Goldborough and Jackson pleaded Guilty, Baily Not Guilty, and formal proof was given of the purchase of the milk. The milk sold by Goldborough was stated to have been adulterated to the extent of 20 per cent., and he was fined 20s. and costs; that sold by Jackson to the extent of 25 per cent., and to the extent of 30 per cent in the case of Baily. Both these defendants were, however, keepers of cows, and the milk drawn on the premises.—Mr. Cooke inflicted fines of 40s. and costs in both cases.

Selling Bad Butter at Barrow.—Mr. Hugh McKenna, butter Merchant, was charged with refusing to sell a certain article of food—viz., butter—by retail in the public market, the value of the quantity required having been offered to him by Mr. Superintendent Barker, who wanted the butter for public analysis. Mr. Nalder appeared for the defence, and pleaded not guilty. Superintendent Barker, in reply to the chairman, said he held his authority in this matter, under the Food and Drugs Act as inspector of weights and measures. On Saturday, September 23, he visited defendant's stall in Barrow market, and observed a quantity of butter thereon lying in lumps. Pointing out a small lump he asked what was the price of it. The defendant replied, that it was 1s. 4d. per lb. He then said, "Weigh me a pound," which the defendant did. Witness then tendered 1s. 6d., stating at the same time that he was going to have the butter analysed. The defendant, on hearing this, took the butter off the scales, and, having smelt it, said, "I won't let you have this." Witness said, "you weighed that butter for me and you had better let me have it; if not I shall summon you for refusing to sell it." The defendant replied, "This is what I sell to the confectioners for making pastry, and I won't sell it to you." Cross-examined by Mr. Nalder: Witness did not select the butter as the worst on the stall. The defendant did not raise any objection to sell it till after hearing that it was wanted for analysis. Mr. Nalder wished to show that this butter was not sold as an article of food. Mr. Fell observed that the quality of the butter was not in question. The defendant was charged with refusing to sell the inspector the butter on the stall. Mr. Nalder: Which we say was not being sold as food. Mr. Fell: You may take that point if you like. Police-constable Potter said he was with Superintendent Barker when he visited the defendant's stall, and proceeded to corroborate Mr. Barker's evidence. Mr. Fell: Where did he take this butter from? Witness: He took it from the top lumps on the counter. Mr. Fell: So far as you observed, the superintendent made no special selection? Witness: No, sir; he did not. When he told him he wanted it to be analysed, McKenna took the butter in his hand, unfolded the cloth that was wrapped round it, smelt it, and said, "I will not sell you this, but I will sell you that," pointing to another piece on the counter. Mr. Fell: Then it was wrapped in a cloth when Mr. Barker offered to purchase? Witness: Yes, sir. The only reason the defendant assigned for refusing to sell the butter was that he sold it to confectioners for pastry purposes. Mr. Nalder inquired whether 1s. 4d. per lb. was not a very low price for butter. Witness replied that he saw some in the market that day for 1s. 2d. Mr. Nalder: But it was not fresh butter. Witness: I don't know. Mr. Nalder asked if McKenna did not offer to sell the inspector fresh butter at a higher price. Witness did not recollect the defendant saying anything about fresh butter at all. Mr. Nalder, this is a case of great importance to the butter trade. Mr. Fell: It is a case of great importance to the public. Mr. Nalder, wished to show what the butter was used for. He was informed that they had a quality known in the trade as "pastry" or "second" butter, which was generally sold to pastrycooks for buttering their tins, and 1s. 4d. was the price of this particular class of butter. His client never intended to sell this for food, and no person would be foolish enough to buy an article for food which was merely intended for greasing cooking utensils. A superior class of butter at 1s. 6d. per lb. was offered to Mr. Barker, and his client was quite willing that this butter which he sold for food should be analysed. The butter which he refused to sell was not exposed there as an "article of food," which was the wording of the summons. Superintendent Barker: Mr. Nalder has just stated that 1s. 4d. is a cheap price for butter. I may say in reply, that I bought a sample at another stall for 1s. 2d. per lb. on the same day. Mr. Fell said the Bench had been considering if the defendant might be called as a witness, which did not appear quite clear in the section. Mr. Nalder remarked, that if he could not be called he could not have any witnesses for the defence without an adjournment. The defendant was then called. He said he had had twenty-eight years' experience in the trade, and at the present time regularly imported large quantities of butter from Ireland. After a length of time butter would not sell for table purposes, and it was then used for several things, the better quality of this inferior class of butter being used for pastry purposes. His best butter was 1s. 6d. per lb., and it was very seldom he sold any of the inferior quality in the market; when he did it was for pastry purposes. It would damage his trade if he attempted to offer this secondary butter for food, and he had only refused to sell Mr. Barker as good butter, to be analysed as food, what he sold for refuse butter. Mr. Nalder expressed the hope that, as this was the first case under the Act, a lenient penalty would be imposed. Mr. Fell said there could not be a clearer case, and the magistrates were agreed in imposing half the full penalty of £10 attaching to this offence, with costs.

THE ANALYST.

SOCIETY OF PUBLIC ANALYSTS.

The usual ordinary meeting of this Society was held on Wednesday Evening, the 15th inst., in the rooms of the Chemical Society, Burlington House, Piccadilly. Dr. Dupré, F.R.S., in the absence of the President, occupied the chair.

On the motion that the minutes of the last meeting (held at Glasgow) be confirmed, a discussion arose as to the desirability or otherwise of confirming a certain resolution, the practical result of a compliance with which it was considered would be to limit the power and fetter the hands of the publication committee of this journal. Eventually the minutes were confirmed with the exception of the objectionable resolution referred to, which was unanimously rescinded and ordered to be struck out of the minute book.

The name of Mr. R H. Harland, F.C.S., who applied for admission as a member was read.

The following papers were then read by their respective authors, and discussed—

The detection and estimation of Castor and other fixed Oils in Balsam Copaiba, by Dr. Muter.

Note on "Patent Imperial Finings" for the use of Brewers, by A. Angell.

Note on a simple apparatus for the Volumetric determination of Carbonic Acid in Carbonates, by G. W. Wigner.

A classification and description, designed to facilitate the detection of the presence of Starches which are added to certain articles of Food and Drugs, by Dr. Muter.

THE PUBLIC, AND "PUBLIC ANALYSTS."

That much ignorance exists in the public mind with respect to the real function of "The Public Analyst" under the "Sale of Food and Drugs Act," is evident from the paragraphs which from time to time appear in different journals, and which could only be justified, were it the analyst's duty to procure samples, institute prosecutions, and indeed insure convictions, as well as to make analyses. Thus, we are told that in a certain place, the rate-payers are being made to pay for nothing, as the analyst confesses in his quarterly report, that he has not analyzed a single sample, or again, that the analyst's report was read with the usual result, viz., that everything he had examined was found to be genuine!!! &c.

Not only so, but if an analyst meets any of the inhabitants of his district he is pretty sure to be saluted with the inquiry, "what are you about, you prosecute no one? while to my knowledge, the district is full of adulterated food." With a view to dissipate the misapprehension which underlies these remarks, we propose not only to state—what everyone might know for himself—that the analyst has nothing to do but to examine *samples that are brought to him;* but also to point out the difficulties which often lie in the way of his procuring such samples, as would give anything like a fair idea, of the articles sold in the district.

There are some Vestries and District Boards, which show only too clearly that they have no desire that the fact that adulterated articles are to be found in their parish should be published. The inspector soon takes his cue from his superiors and purchases articles where there is no chance of obtaining any that are not pure, and the vestrymen, when the analyst's report is read, stating that everything he has examined during the quarter was genuine, exclaim with one voice "how very satisfactory!"

A much more frequent cause of difficulty in procuring fairly representative samples is the jealousy which Boards feel of anything being procured without their express order. At a meeting of the Board a resolution is passed that "the Inspector be ordered to procure so many samples of such an article, and submit them to the Analyst." This is published in the local paper next morning, and it is not surprising that after this kindly warning only pure samples of the article in question are sold in the district (except by accident) till the specified number is known to have been bought. The fact that the Inspector is always well known to the shopkeepers in his district is also a great hindrance to his procuring samples of inferior quality, and if he be not a man of resource, with a good deal of the spirit of a detective in him, he will rarely succeed in doing so.

But, perhaps, the worst feature of the case is that the public who complain (often, we believe, without cause) of the food supplied to them, and of the Analyst for not making it better, will not move a finger to help themselves. Under the older Adulteration Act, when the local authority had power to prosecute the vendor of an article brought for analysis by a private individual, and to *subpœna* that individual to prove the purchase, scarcely an article was so brought, or if brought, was often taken away again as soon as the purchaser became aware of the fact that if it was found to be as he suspected, he would have to give evidence in a Police Court. Under the present Act, where the purchaser may (if he will) become the prosecutor, but need not unless he likes, the Analyst is often called on to make analyses not really for any public good, but merely to satisfy the mind of the purchaser, and if the Analyst ventures to hint to him that the intention of the Act is to put a stop to adulteration by punishing those who are guilty of it, and that, therefore, he ought to prosecute the vendor, if the certificate of analysis justifies such a course, he generally replies, "Oh! I could not go into a Police Court; of course, I shall not deal at that shop any more." We are convinced that more good would be done to honest tradesmen, and the intention of the "Sale of Food and Drugs Act" be better carried out if, for a short time, the public, or even a few individuals, would make up their minds not only to have suspected articles analysed, but to take the trouble of prosecuting if they were found impure.

We may here remark that a doubt exists in some people's minds whether, if they purchase an article, and when they begin to use it have reason to believe it impure, they can have it analysed under the Act, as they cannot give the vendor the option of keeping a sample of the article. We have good legal advice that they can do so, the clause requiring articles to be divided relating only to those bought "with the intention of submitting the same to analysis," which clause does not take away the power granted by clause 12 to any purchaser of any article of food or drink to have it analysed if he wishes. If this opinion be correct, of which we have little doubt, it takes away the only excuse the public really have for not doing their share in carrying out the "Sale of Food and Drugs Act," and we can promise them that if they will awake to a sense of their duty, every aid will be given them by the much abused Public Analysts.

ANALYSTS' REPORTS.

The report of Dr. Dupré, analyst for the Westminster district, for the quarter ending September 29, just issued, states:—"During the quarter just elapsed twenty-four samples of articles of food have been examined, namely:—Of bread, 9 samples; milk, 15. The results of the examinations, I am happy to be able to report, have been very satisfactory. All the samples of bread were found to be pure wheat bread, free from alum or other foreign admixture."

The annual report of Dr. Corfield, analyst to the parish of St. George's, Hanover-square, states that of five samples of butter examined, three were found to be genuine, one poor, and one largely adulterated with foreign fats, and a certificate to that effect was given to the purchaser. Of eight samples of tea analysed, five were genuine, two fairly good, and one contained exhausted leaves. Of four samples of vinegar got to obtain information, three were genuine and one adulterated with sulphuric acid.

SOCIETY OF PUBLIC ANALYSTS.

Those of our readers who have read a recent article which we felt it our duty to write in reference to a case of Butter Adulteration in Scotland, as well as a second one in reply to an attack made upon "*The Analyst*" by Mr. Dittmar, in a Scotch newspaper, and a third one commenting upon the unusual course pursued by a gentleman who had made himself conspicuous in the controversy, will not be surprised to hear that Mr. J. Alfred Wanklyn has no longer any connection either with "The Society of Public Analysts" or "*The Analyst*."

We notice that Mr. J. Alfred Wanklyn has already announced his secession from the Society in the "*Chemical News*," and we are happy to be able to confirm the accuracy of his statement.

We may add that Dr. Stevenson is no longer Treasurer, as he has retired from the Society.

UNPUBLISHED PROCESSES OF ANALYSIS.

After, and to a great extent, in consequence of, the passing of the Act of 1872, for the prevention of adulteration, a great *impetus* was given to analytical work.

Many articles of food and drugs which had previously only been analysed as curiosities came to be carefully examined for the purposes of the Act, and processes were worked out with care, for the detection of any impurities or adulterations which might be present.

Some few of these processes were published; but until the formation of "The Society of Public Analysts," chemists, as a rule, worked according to their own individually acquired knowledge, there being no authenticated collection of those processes which had been found successful.

"The Society of Public Analysts" took the first step in this direction, and by the reading, discussion, and publication of papers, gradually familiarised its members with a number of processes which had been carefully worked out and their accuracy tested.

By these means public analysts have so far adopted a uniform system of work, and made a uniform allowance (necessarily an excessive one) for the natural impurities and variations of samples, that it is now quite the exception to have an analysis disputed.

So far, no doubt, the Society deserves credit, and any one who examines the first volume of its "Proceedings," will find that no previous work has contained so much information on food analysis. *The Analyst* has endeavoured to continue this work, and has published the description of numerous processes for the analysis of many commercial samples other than articles of food, but an examination of the authorship of these articles, as well as of those which have appeared in our scientific contemporaries, clearly bring out the fact that the greater part are contributed by a very limited number of chemists.

There are, probably, at least two hundred individuals who fairly deserve to be described as "analysts," and yet we are of opinion that not one fourth of them have ever contributed any number of analyses of different varieties of some known substance, still less the descriptions of any new processes.

We do not, by any means, intend to limit our remarks to food analysis; but leaving out that class of original work which consists in the discovery of previously unknown substances (highly essential though this is), we believe that not fifty chemists in England have, during the last five years, contributed anything which can be considered really in advance of the analytical methods previously in use; and some of what it is the fashion to call "leading chemists," have done absolutely nothing.

If analytical chemistry is to take its proper rank as a profession, this must be changed.

Analysts, young and old, must make public the results of their work, and the columns of scientific journals must show not only descriptions of many processes, but the names of many discoverers of the same.

It is not given to every one to be a Davy, or a Faraday, but every chemist who honestly works, can contribute to the common fund *something*, which shall at least have the merit of being alike original and accurate.

ON THE VOLUMETRIC DETERMINATION OF CARBONIC ACID,

By G. W. Wigner, F.C.S.,

Read before the Society of Public Analysts, November 15, 1876.

I have used for some time a very simple apparatus for the volumetric determination (in a gaseous state) of the combined Carbornic Acid, in Carbonates. Schiebler's apparatus is, of course, only adapted for those carbonates which produce salts with Hydrochloric or Nitric Acid, which are readily soluble in cold water, and although it is an extremely handy instrument, it is open to several objections, the principal of which are—

That the temperature of the evolved carbonic acid gas, requires to be carefully taken, and this can only be done by taking the temperature of the external air, and allowing the instrument to rest, until the evolved gas has acquired this temperature, and

That the acid solution used to decompose the carbonates, absorbs a proportion, and (according to my experiments) an irregular amount of Carbonic Acid, and finally the scale of the instruments is purely empirical.

Most laboratories are now furnished with the McLeod apparatus, or with some similar efficient apparatus for measuring the volume of gases under known conditions of temperature and pressure, and I have therefore devised a simple apparatus for the decomposition of carbonates, and the measurement of the gas evolved.

I take a test tube of about 7 inches by 1 inch, and provide it with a good India rubber stopper, bored with two holes. Through one of these holes I pass a tubulated thistle-headed funnel of small size, furnished with a stop-cock, and through the other a bent piece of small bore glass tubing, also provided with a stopcock.

This bent tube is coupled to the McLeod, or other gas measurement apparatus, by a short length, (say 6 inches) of very stout, small bore, India rubber tube, 1-16in. is large enough for the bore of this.

In the bowl of the thistle funnel, I put a glass marble, and in the interior of the test tube, a smaller test tube of about 2in. + ⅜, containing the sample to be analysed.

The apparatus is shown complete in the accompanying sketch.

The process is as follows:—

The tubes of the McLeod apparatus are filled with mercury, as if for an ordinary gas analysis, and the stopcocks closed. The sample, (say 25 grains of carbonate of lead) is weighed and transferred to the smallest tube, and about half-an-ounce of distilled water is poured into the large test tube. The small tube is then carefully dropped in, taking care that its mouth is above the level of the water in the

large tube; the stopper, into which the funnel and bent tube have been inserted is then carefully put in place, and the whole held in a slightly oblique position in a retort stand clamp, on the ordinary rising table of the McLeod apparatus; the India rubber tube is then coupled up to the facets of the measuring tube of the McLeod apparatus. If the stopcocks on the bent tube, and on the funnel are opened for a moment, any excess of air in the India rubber tube is liberated.

The stopcock on the bent tube is now closed, and the mercury in the measuring tube of the McLeod apparatus allowed to fall, so as to produce a vacuum.

The stopcock on the funnel remains open, and a lamp is applied to the bottom of the test tube, until the water boils briskly when distilled water is poured into the funnel and kept from running into the test tube by the pressure of steam generated by the ebullition of the water; the boiling is continued until the steam escaping through the funnel and under the glass marble, *all condenses*, showing that the tube is filled with pure steam. The lamp is now withdrawn, and the stopcock instantly closed. This is not difficult, as it is three or four seconds before the water in the funnel begins to draw back.

Meanwhile, a portion of dilute nitric acid has been boiled on another burner, and is poured into the funnel. I prefer not to use much more than is necessary for the liberator of the carbonic acid present. The stopcock on the bent tube, and the stopcock on the measuring tube of the McLeod apparatus are opened, and then the stopcock on the funnel is cautiously opened. The hot acid, of course, immediately runs in, and the only precaution necessary, is to avoid liberating the gas too quickly.

When the test tube is about two-thirds full and all effervescence has ceased I again boil the solution in the tube, and then, still maintaining a partial vacuum, by means of the mercury, fill the tube *completely*, through the funnel with *boiling* distilled water, until every bubble of air is driven into the measuring tube of the McLeod.

The stopcock on the bent tube is then shut and the mercury in the pressure tube and the measuring tube of the McLeod brought to the same level. This brings the internal pressure of the air on the short india rubber connecting tube to the atmospheric pressure, and as its volume does not exceed 1c.c. the correction for its temperature may be safely omitted.

The gas is then measured in the ordinary way, and its volume calculated to weight and per centage.

I find that it is easy to make four determinations of carbonic acid per hour by this apparatus, and the accuracy of the results is very great.

The following are repeat analyses of commercial white lead, taken at random from some hundreds which I have tabulated, and fairly represent the character of the results, since they include the errors incident to determination of temperature, and barometric pressure, as well as those of mere manipulations in the apparatus.

On 25 grains in each case.	1st determination CO_2	12·222	per cent.
	2nd " "	12·274	"
	1st " "	13·836	"
	2nd " "	13·867	"
	1st " "	13·322	"
	2nd " "	13·334	"
	1st " "	13·228	"
	2nd " "	13·212	"
	1st " "	11·707	"
	2nd " "	11·703	"

In 6 determinations in different weights of calc. spar. the results varied from 43·83 per cent., to 43·92 per cent., as against 44 per cent. theoretical. Assuming the calc. spar. to have been absolutely pure, the loss of carbonic acid only amounted to an average of ·10 per cent., 5 grains being about the average quantity used for the analysis.

A METHOD OF DETECTING AND ESTIMATING CASTOR AND OTHER FIXED OILS IN BALSAM COPAIBA.

Read before the Society of Public Analysts, November 15th, 1876.

By Dr. Muter,

This oleo-resin, commonly but wrongly termed a balsam, has been said in books for many years back, to be subject to admixture with fixed oils, especially castor oil. The *British Pharmacopœia* furnishes a qualitative method of examination, but the tests are, in practice, totally insufficient, as the exact degree of rectification of the benzole (an important point) is not stated, and the difference between a pure balsam stain and that with a small percentage of oil is very slight, unless the two are observed side by side. The other methods which have been proposed may be summarised as follows:—

1. Pure balsam gives a translucent and not an opaque emulsion, with strong solution of ammonia.
2. Pure balsam, if boiled with water for some hours, leaves a tenacious resin.
3. The specific gravity.

The latter test is entirely fallacious, owing to the great variation in commercial samples, and the others, though possibly characteristic with large admixtures, fail with anything under 20 per cent.

Observing the close affinity between copaivic and pinic acids, it struck me that advantage might be taken of the difference of solubility of the sodium soaps in certain *menstrua*. A very good solvent for sodium pinate has been discovered by M. Barfoëd to be a mixture of five parts by volume of *absolute* ether, and one part *absolute* alcohol, which, moreover, only dissolves sodium oleate to an exact extent corresponding to 1 in 1,000 of oleic acid. I will not occupy space by detailing at length the numerous experiments on a great number of samples of balsam, varying in age and colour from every known commercial source, but the whole thing ended in the certain conclusion that besides the essential oil (which is dissipated in the process of analysis) good commercial balsam contains only copaivic acid, which forms a sodium salt, instantly soluble in the ether-alcohol mixture, and a little altered resin not so readily saponifiable, forming a salt only slowly soluble. The amount of this second resin I have found to vary slightly, and, in very old samples, especially of Maranham balsam may sometimes amount to five per cent., although usually really less. Going upon the principle that performing any official analysis the lowest commercial standard should be taken, I have adopted six per cent. as the highest possible quantity of the second resin ever existing in any sample of balsam still having a trace of odour remaining. This wide standard may sometimes lead to an under estimation of the oil by two or three per cent., but renders any over estimation impossible.

The actual process I employ is as follows: 3 to 4 grammes of the sample are weighed into a clean dry flask, and saponified on the water bath with 50 c.c. of alcohol and lump of caustic soda, weighing not less than 5 grammes. When all is dissolved water is added, and the whole washed into a half-pint basin so as to nearly fill it, and evaporated to 100 c.c. over a low gas flame. Dilute sulphuric acid is then added till the whole just becomes permanently turbid, and then solution of caustic soda is dropped in till it *just clears* again. By this means a solution is obtained with the least possible excess of alkali, and with a good amount of sodium sulphate. The whole is now evaporated to *perfect dryness** on the water bath, stirring towards the end, so that the sulphate may mix with the soaps and produce an easily pulverulent residue. The residue is removed from the basin into a small wide-mouthed stoppered bottle, and treated with 70 c.c. of

* The best way to ensure absolute dryness is to moisten the apparently dry residue with a few drops of absolute alcohol and again dry.

ether-alcohol, and well shaken up. As soon as it is fairly settled the fluid is filtered off through a *quick* filter, and this is repeated with two successive quantities of 70 c.c., making 210 c.c. in all of the solvent used. The residue in the bottle and on the filter now consists of sodium oleate and sulphate if the balsam be impure, and of the latter only if pure, with a little trace of the insoluble resin soap already referred to. The contents of the bottle and filter are then dissolved in warm water, and after heating until all smell of ether is gone, the whole is boiled, freely acidulated with hydrochloric acid, and set to cool. If, when cold, nothing but a few specks of brown resin should rise to the surface, the balsam is pure, but if an oily layer be formed, it is adulterated, and the smell of the separated oleic acid will at once determine whether it is actually castor oil or not. In the case of the presence of oil, two grammes of pure and dry white wax are added, and the whole heated till the wax melts with the oleic acid. On cooling, a solid cake is formed, which is detached from the side of the beaker, and the fluid below passed through a filter. The cake is once more melted in boiling water, cooled, detached, dried by gentle pressure in blotting paper, put into the water oven in a weighed platinum dish till dry, and then weighed, and the weight of the wax used deducted. The beaker, filter and rod, &c., used are, if at all dirty, dried, extracted with ether, and the residue, left after evaporation, weighed and added to the total.

The calculation is then performed as follows:—

1. To the weight in grammes found, add ·20 for loss of oleic acid in solvent, and then say as

   95 : 100 :: total oleic acid.

2. Calculate to per cent. from the quantity taken, and from the total percentage deduct six per cent. for possible altered resin in the balsam.

Out of the whole number of samples I have done, I have selected the following twelve, as being fair representations of the degree of accuracy obtainable by the process. The error, owing to the correction, of course increases with the amount of oil present, but it is always an error in the direction of under estimation, which is the great point for public analysts.

Nature of Sample.	Calculated.	Found.
Para (pale)	Pure	No oil drops.
Para (pale)	23·60 per cent. castor	23·50
Old Para (dark)	Pure	No oil drops.
Old Para (dark)	51·0 per cent. castor	50·0 per cent.
Carthage (medium)	Pure	No oil drops.
Carthage (medium)	21·5 per cent. castor	21·20
Maranham (pale)	Pure	No oil drops.
Maranham (pale)	26·5 per cent. castor	26·27
Old Maranham (darkish very little odour)	Pure	No oil drops.
Old Maranham (,, ,,)	47·3 per cent. castor	46·4
Para (fine pale)	Pure	No oil drops.
Para (fine pale)	21·4 per cent. lard oil	20·9

In conclusion, I may say, that the process, although it looks formidable, is in practice very simple, and for all ordinary purposes, if the beaker be well scraped out, the weight of the main cake, may be taken as sufficient to give an analysis true within 3 per cent. *below* the real amount, which is accurate enough for public purposes, and saves time and the expense of the extra ether. Unless oil actually floats *and remains on cooling in fluid drops*, after adding the hydrochloric acid, the sample may be passed as good.

When working on 3 to 4 grammes, with an admixture of not over 25 per cent., the errors due to loss of oleic acid and insoluble resin soap respectively so nearly balance each other, than any correction is unnecessary, and the actual amount of oleic acid found may be taken as correct within a per cent.

Mr. Hehner stated, that he had experience of Barfoed's process for the analysis of resin soaps, and had found it successful, and he had no doubt that if copaiba behaved like resin the process would be reliable.

Dr. Bartlett, thought it a very good process, so long as no other foreign substance was present, but feared that the presence of boric acid might be found to interfere seriously with its accuracy, as he had sometimes found to be the case in soap analysis.

Dr. Dupré, inquired whether the testing of the ethereal solution would give any data for estimating the proportion of added resin (if any).

Dr. Muter, in reply, said he had not yet tested the ethereal solution for resin, so as ascertain if any had been added, but Dr. Dupré must remember, that it is the detection of oil only that the process aimed at, resin being an extremely improbable addition, as it would spoil the balsam.

The instructions in the P.B., were comparatively worthless; while in the new process, if the oil actually did separate, there was proof positive of adulteration.

As to Dr. Bartlett's objection, although borax sometimes occurred in soap, it never existed in balsam copaiba, nor could it be added to that substance without emulsifying it.

DETERMINATION OF THEIN.

Berichte des Deutschen Chemischen Gesellschaft zu Berlin, 1876. *No.* 14. *Page* 1312.

CORRESPONDENCE FROM ST. PETERSBURG.

[*Meetings of the Russian Chemical Society on the* 6*th and* 18*th May.*]

HERR BUTLEROW (for Herr Markownikoff), reports on the determination of thein in tea. Since the methods hitherto adopted yield unsatisfactory results, partly because they leave out of consideration the peculiarities of the combinations in which thein exists in the tea-leaf, and partly because they are inconvenient; the author proposes the following:— 15 grams of powdered tea are covered with 500 c.c. water, and then, 15 grams burnt magnesia being added for each 5 grams (tea?), rapidly heated to boiling. The liquid is then filtered, the precipitate washed with hot water, and the filtrate evaporated to dryness, with addition of a little magnesia and sand. The thein is extracted from the residue with hot benzol (in a special apparatus, not described), the latter distilled off on the water bath, and after every trace of it has been removed by a gentle current of air, (from a *blowing-bag*,) the thein is weighed. In the opinion of the author, the want of strict accuracy in the method is due to the possible volatilization of a small quantity of thein, with the benzol vapour. His experiments prove, that the quantity of inorganic constituents, which remain as ash, decreases as that of the thein increases. Since, however, the better sorts of tea are made from younger leaves than the poorer, relatively more thein is contained in the young leaf than in the old.

Herr Markownikoff is, moreover, of opinion, that the value of tea is determined, not by its thein, but by tannic acid, ethereal oils, and other constituents.

C. A. C.

FLOWER OF TEA; OR, PEKOE FLOWER.

By T. B. Groves, F.C.S.

Pharm. Journal, [3], 327, *p.* 285.

It appears from Mr. Groves' paper, that 100 lbs. of a substance bearing the above appellation, was received at the Weymouth Custom House for export to Jersey. A portion of it was sent to the London Custom House for report, and an answer was returned that the article was really tea, that it was not the leaf of the plant, but the pollen of its flower.

On microscopical examination, it was at once seen not to be the pollen of the tea flower, or, any other flower: but to be composed of simple uncellular vegetable hairs, mixed with small fragments of tea leaves, together with sand and probably other extraneous substances.

These hairs, by the assistance of Mr. Holmes, were established to be really the hair of the leaf-buds of the tea plant, and the sample was then handed to Mr. Wigner, in order to ascertain its chemical composition. Mr. Wigner's report, is as follows:—

	Analyses of Tea marked Pekoe Flower. per cent.	The average Analyses of Pekoe. per cent.
Ash soluble in Water	1·15	3·30
Ash soluble in Acid	4·54	2·60
Silicious matter	13·04	.30
Total Ash	18·73	6·20
Moisture	7·00	7·30
Extract (soluble in water)	14·65	34·00
Ash of ditto	2·40	5·00
Theine	1·50	3·50
Tannin (Pb. process)	12 00	28 00

The composition of the ash, was as follows:—

Oxide of Iron	6·01	6·00
Lime	4·83	11·00
Magnesia	2·05	
Potash and traces of soda	4·97	32·50
Oxide of Manganese	1·02	
Sulphuric acid	1·29	4·80
Carbonic acid	7·39	12·00
Chlorine	0·61	
Phosphoric acid	5·33	16·00
Silica	66·18	
Loss in analysis	·32	
	100·00	

"I have made several unsuccessful attempts to sift the sample. A large portion of the hair has passed through with the dust. The gross ash yielded by the sifted part corresponded tolerably with that of the original sample. The microscope shows much leaf in fragments, and some of these fragments certainly appear to belong to some plant, which is not tea."

A. W. B.

"GELSEMINIC ACID" AND GELSEMINE.

PROFESSOR SONNENSCHEIN (Berichte, des deutschen chem. Gessellschaft, jahr ix. Sep. 18. p. 1182) has apparently established the identity of Wormley's "Gelseminic Acid," obtained from *Gelseminum Semper-Virens*, with æsculin C_{30} H_{34} O_{19}.

Gelsemine is obtained by treating the alcoholic extract of the root after separation of the resin with basic acetate of lead, filtering, then removing the lead by sulphuretted hydrogen from the filtrate, shaking with ether, and adding potash to an alkaline re-action. The light flocculent precipitate is collected, and purified by redissolving in hydrochloric acid, again precipitating by potash and shaking up with ether. On removing the ether and evaporating it down, Gelsemine is left as an amorphous, almost colourless, alkaline, bitter powder. Gelsemine melts under 100°C to a colourless liquid, at higher temperatures, it is decomposed; it is freely soluble in ether and chloroform, somewhat soluble in alcohol, but not very soluble in water.

Gelsemine neutralizes acids, but as yet no crystallisable salts have been formed. The chloride is readily soluble in water, and gives precipitates with chloride of gold, iodine in iodide of potassium, potassio mercuric iodide, and platinic chloride.

The best test for the presence of gelsemine is the bright light cherry red colour, which a small portion exhibits, if dissolved in concentrated sulphuric acid, to which a small portion of ceroso-ceric oxide has been added. The formula of gelsemine appears to be C_{11} H_{19} NO_2.

A. W. B.

THE BENZOATES IN SUINT.

By ANDREW TAYLOR, F.C.S.

Pharmaceut. Journal. [3] *No.* 327, *p.* 272.

MR. ANDREW TAYLOR has made some experiments with regard to the extraction of Benzoic Acid from *Suint*, he distilled in an 80-gallon steam jacketed still, working at a pressure of 20-lbs. to the square inch, equal parts of petroleum spirit and suint, until a ton of the latter had been operated upon. A yellow fatty liquid of sp. gr. 1·2 was by this means obtained, which gave characteristic tests for benzoic and hydrocyanic acids. Eight gallons of this liquid were mixed with about a gallon of hydrochloric acid, and heated in a steam jacket for about an hour and a half, there was a copious evolution of ammoniacal and other fumes, and the residue consisted of a brown liquid rich in benzoic acid. From this ¾-of a pound of benzoic acid was obtained, or nearly three pounds to the ton of suint.

A. W. B.

REVIEWS OF BOOKS, &c.

A SYSTEMATIC HANDBOOK OF VOLUMETRIC ANALYSIS.

By FRANCIS SUTTON, F.C.S., &c., &c.

London, J & A. CHURCHILL, 1876.

THIS is a third edition of this useful work, which has, as the preface states, been out of print for nearly two years. The author specially acknowledges the valuable aid he has received from Mr. Thorp and Professor McLeod, and points out that the latter has, "with characteristic modesty," said but little about his own special improvements in the apparatus for gas analysis. We find a confirmation of this statement in the fact that we do not discover any reference to the last new form of "facet" which Professor McLeod

has devised for his gas analysis apparatus, which though a small improvement, is one certain to be appreciated by all who are in the habit of using the apparatus.

The present edition contains about 50 pages of new matter, some 15 pages of which relate to the analysis of water.

Among the additions, we notice the colorimetric processes for the estimation of iron and copper, which are rightly included in such a work.

Volumetric processes are also introduced for the determination of nickel, cobalt, bismuth, cadmium, uranium, arsenic and bromine. We have not yet been able to form an opinion on these processes, from actual experiments, but they appear to be useful additions to the work. The processes for the determination of zinc and manganese appear to be revised and judiciously extended.

The book appears fairly free from *errata,* but there are two of such importance, that they need a notice here. On page 86 in the description of the indirect process for the estimation of potash and soda, a factor is stated as 0·36288, whereas, if we adopt the equivalents used in the book, namely, Na=23, K=39, this factor will be 3·6562, (or more than ten times as high as quoted.) The mistake is evidently a double one, arising from the misplacing of a decimal point, and the mis-calculation of the factor. The key to the mis-calculation is found on page 330, where, however, the directions for the calculation are again in error.

An alteration in the mode of setting the type in the description of the details of the processes, certainly adds to the convenience of the work as a book of reference. The extra matter (some 15 pages) introduced with reference to the Frankland and Armstrong water process will also be valued by those chemists who adopt that mode of analysis; but we cannot avoid an expression of regret that the much more serviceable process devised by Messrs. Wanklyn, Chapman & Smith, is passed over with only some half dozen pages. This is the more unfortunate, since we believe we are quite safe in assuming that the latter process is at least ten times as much used as the former.

We notice that, under the head of Sugar, our author omits all reference to Polarization, we presume, because it would hardly come within the title of volumetric analysis. Yet all who are in the habit of analysing sugars daily, know well that no other method can be depended on to give results, within two or three per cent.

The processes for Tannin determination are considerably enlarged and improved, and the same remarks will apply to the determination of urea, phosphoric acid, and zinc.

On the whole, the new edition is unquestionably of greater value than its predecessors, and certainly forms by far the most complete *resumé* in the English language of volumetric processes of analysis, and very few such processes, which have any pretensions to accuracy are omitted. We must not forget to mention one great point in the author's favour, namely, the extreme care which has been taken to acknowledge the source, from which the processes have been derived.

WATER ANALYSIS: A PRACTICAL TREATISE ON THE EXAMINATION OF POTABLE WATER.

By J. Alfred Wanklyn, and Ernest Theophron Chapman.

Fourth Edition.—*Rewritten by* J. Alfred Wanklyn, M.R.C.S., *&c., &c.*

London: Trübner & Co.

This Edition of the above treatise, has been enlarged and improved in various directions. The work is now divided into three parts: the first part gives direction for "Water Analysis for General Sanitary Purposes;" part two, treats of "Special Analysis, &c.;" and part three, gives "Examples of Complete Mineral Analyses." The directions given are, for the most part, precise and to the point, and we can confidently recommend the little work to all requiring a guide to the analysis of water.

The albuminoid ammonia process, which is the back-bone of the work, has in the course of the last eight years, worked its way into very general use. This cannot, we think, be attributed entirely, or even mainly, to its exceeding simplicity, as some of its opponents allege, but is, we believe, due chiefly to the conviction becoming more and more general among water analysts, that its indications taken in conjunction with a few other constituents of the water, are amply sufficient to guide them to a correct conclusion. In part, however, it must be ascribed to the very complete way in which the process has been placed before chemists by its inventors. Thus we know, for certain, that the presence of even considerable proportions of ammonia, or of nitric acid, is absolutely without influence on the estimation of the albuminoid ammonia. We know also the behaviour of a great variety of nitrogenized substances, when submitted to the process. There is, therefore, a great body of experimental evidence, showing what the albuminoid ammonia process is, or is not, capable of accomplishing.

It is far otherwise, with the rival process of Professors Frankland and Armstrong. Many thousand analyses have been made in Prof. Frankland's laboratory, by means of this process, but as far as we know, not a single experiment has been made, certainly not one has been published, which really demonstrates in a satisfactory manner, the soundness of the method as applied to the analysis of water. Most chemists are, we believe, convinced that, assuming the organic matter to be once inside the combustion tube free from an admixture of nitrates, its carbon and nitrogen can be estimated with an extraordinary degree of accuracy, by means of Frankland and Armstrong's process. The real questions, however, are, firstly: does the process enable us to get the organic matter dissolved in a litre of water into our combustion tube undiminished in quantity, and freed from the large excess of nitrates, with which it is often associated, and secondly, can we make accurate allowance for any ammonia which may be present in the water? None of the published experiments prove these absolutely vital points, and we venture to affirm, that until Dr. Frankland, or some other chemist, supplies this necessary experimental evidence, the combustion process will find but few adherents.

But while thus strongly recommending Mr. Wanklyn's work, we would not be understood as endorsing everything the author advances, for he has committed many sins, both of omission and commission. Thus we believe that Mr. Wanklyn seriously, and most injudiciously, under-estimates the importance to be attached to the presence of nitrates in water, and the same may be said regarding phosphoric acid. The chapter on gases dissolved by water, is most meagre, none of the newer processes for their estimation being given. A special chapter is given to iodates, bromates and chlorates, the latter of which have never yet been found in a natural water, while nitrous acid is only once incidentally mentioned, and no test is given for its recognition, and sulphuretted hydrogen is not even alluded to. Very little information is given respecting the presence of the alkaline chlorides, nothing whatever for example is said regarding the conclusions to be drawn in case either the potassium or sodium chloride is found to predominate. These and like defects, we hope to see made good in the next edition, which, we doubt not, will soon be called for.

In conclusion, we must express our deep regret, that Mr. Wanklyn has introduced controversial matter into the pages of his work; such matter is wholly out of place in a ·, and when put forward in the manner in which it is here done, it constitutes erious blemish in an otherwise most meritorious work.

LAW REPORT.—COURT OF APPEAL.

Bigsby v. Dickinson.

This was an action for the suppression of a nuisance alleged to have been caused by the defendant in the manufacture of sulphate of ammonia and anthracene, and as it possesses some points of interest to chemists, we give a condensed report of it.

The Defendant, Dickinson, manufactures sulphate of ammonia and anthracene in Deptford. The Plaintiff, and other persons, having complained that in so doing he created a nuisance, the local authorities, last year, took summary proceedings before the Police Magistrates to compel an abatement of the nuisance. After hearing the case, it was dismissed on a technical objection, that sulphate of ammonia being "the product of a mineral" its manufacture was exempt from the usual liabilities to prevent nuisance.

The Plaintiff, Bigsby, then applied for, and obtained, two interim injunctions, but on a full hearing, extending over eight days, before Vice Chancellor Bacon, the Bill was dismissed.

The Plaintiff appealed, and the case was heard in the Court of Appeal, before Lords Justices James, Baggallay, and Bramwell, the hearing extending over five days.

The Plaintiff's case was, in effect, that he and his family, at intervals, suffered seriously by the fumes of sulphuretted hydrogen, which were emitted from the Defendant's works, and the evidence of some of the witnesses went to prove that at times certain irritating vapours, of other character, were also evolved.

The Defendant's case was that the nuisance had been greatly exaggerated; that it might have been caused by other factories, and, that the Plaintiff himself, being a varnish maker, would produce large quantities of sulphuretted hydrogen, which would produce the effects of which he complained.

For the Plaintiff numerous witnesses were called, who proved the existence of a serious nuisance, and some of these witnesses actually swore that they were able to trace it to the Defendant's works.

For the Defendant, the general purport of the evidence was that the works were "perfect," and that, except by gross carelessness or wilful negligence, no such nuisance as that complaimed of could possibly be produced.

On the appeal the Plaintiff applied for, and obtained, leave (which had been previously refused by the Vice Chancellor) to prove that the materials which he used did not, and in fact could not, produce a sulphuretted hydrogen, and proved this fact to the satisfaction of the three Judges.

Their Lordships gave separate judgments, all, however, being in favour of the Plaintiff. The decisions may be summarized as follows:—

That the existence of a serious nuisance arising from sulphuretted hydrogen had been proved. That this nuisance occurred at intervals only, and then mostly at night, when the fires for consuming the waste gas from the Defendant's saturators were likely to be out. That the nuisance did not arise from the Plaintiff's own works. That in some cases the noxious fumes had been clearly traced to the Defendant's works, and finally, that the defence of "perfect" works *only* could be of no avail, because the testimony of a few witnesses, who had smelt the offensive odours, was necessarily of more value than the evidence of hundreds of witnesses who had failed to do so.

The judgment of the Court below was, therefore, reversed, and an injunction given in the terms of the Plaintiff's Bill.

The Analysts engaged in the case were for the Plaintiff, Mr. Heisch, the late Dr. Letheby, Dr. Voelcker, Messrs. Wigner and Wanklyn. For the Defendant, Messrs. Campbell, Manning, Tribe, and Dr. Wright.

The case will form a valuable precedent for the future suppression of such nuisances.

RECENT CHEMICAL PATENTS.

The following specifications have been published during the current month, and can be obtained from the Great Seal Office, Southampton Row, Chancery Lane, London.

No.	Name of Patentee.	Title of Patent.	Price.
656	E. Hunkler	Varnish	8d.
670	J. Firth	Dyeing	6d.
708	N. C. Cookson	White Lead	4d.
854	S. G. Thomas	Roasting and amalgamating Ores	6d.
858	M. H. Strong	Manufacture of Gas	6d.
903	Cammack & Walker	Manufacture of Sulphates of Soda and Potash ...	6d.
1003	L. T. Wright	Revivifying Foul Gas Lime	2d.
1068	H. E. Newton	Colours used in ornamenting Glass	2d.
1106	C. T. Ashmore	Baking Powder	2d.
1121	C. Muratori	Manufacture of Paints	2d.
1157	S. S. Lewis	Soap	2d.
1172	Archbold Cooper & Wanklyn ...	Distilling Spirits	2d.
1194	W. R. Lake	Manufacture of Nickel from its Oxides	6d.
1196	A. M. Clark	Air and Waterproof Fabrics	2d.
1229	J. H. Johnson	Preparing Colouring Matters for Dyeing ...	4d.
1278	C. Reimer	Obtaining Aldehyds from Phenols	2d.
1293	E. P. H. Vaughan	Manufacturing Sugar	2d.
1355	F. Hills	Treating Sewage	4d.
1368	J. Riley	Manufacture of Soda Ash	2d.
1541	H. E. Newton	Revivifying Animal Charcoal	4d.
1552	J. Fleming	Vulcanized India Rubber Types, Stamps, &c. ...	2d.
1567	E. Oliver	Disinfectants for treating Fibrous Materials ...	2d.
1596	J. Hooker	Mixing Cocoa, Corn Flour, &c., with Milk ...	2d.
1597	J. Hooker	Prepared Milk	2d.
1682	H. L. Jones	Disinfectants and Deodorizers	4d.
1704	B. Fixsen	India Rubber and Gutta Percha Compounds ...	4d.
1705	D. C. Lowber	Disinfecting and Packing Manure	2d.
1714	A. Blake	Treating Grains	4d.

FINES FOR OFFENCES AGAINST THE "SALE OF FOOD AND DRUGS' ACT," IN IRELAND.

D. Farrell, for refusing to serve an Inspector	£5	0	0
P. Nolan, for selling milk adulterated with 25 per cent. of water	4	0	0
T. Lambert, for selling milk adulterated with 20 per cent. of water	3	0	0
W. Barry, for selling milk adulterated with 30 per cent. of water	5	0	0
L. Woods, for selling milk adulterated with 20 per cent. of water	3	0	0
P. Murphy, for refusing to serve an Inspector	10	0	0
P. Behan, for refusing to serve an Inspector, (with the alternative of imprisonment with hard labour for three months)	5	0	0
P. M'Arabe, for selling milk adulterated with 20 per cent. of water	3	0	0
Kate Kenna, for selling milk adulterated with 50 per cent. of water	9	0	0
J. Doran, for selling milk adulterated with 20 per cent. of water	3	0	0
G. Keogh, for selling milk adulterated with 20 per cent. of water	3	0	0
J. Cullen, for selling milk adulterated with 20 per cent. of water	3	0	0
P. Brookall, for selling milk adulterated with 10 per cent. of water	3	0	0
J. Leneham, for selling milk adulterated with 30 per cent. of water	5	0	0
M. Maguire, for selling milk adulterated with 30 per cent. of water	5	0	0

We take the foregoing fifteen cases from the *Irish Times*, of the 3rd inst., and seeing that they were all tried on the same day, that the analyses were all performed by one analyst (Dr. Cameron), and that the fines amount in the aggregate to £69, we think the tabulated report will be of interest to some of our English brethren, in whose districts, for similar offences as those detailed above, half-crown and five shilling fines obtain.

PROSECUTIONS UNDER THE SALE OF FOOD AND DRUGS' ACT.

At Marlborough Street.—Mr. Edwin Holland, cheesemonger, 2, Goodge Street, was summoned before Mr. Knox for selling adulterated butter. Mr. Ricketts prosecuted, Mr. Flegg defended. Mr. Ricketts stated that the butter purchased at the defendant's shop was found to be adulterated to the extent of 75 or 80 per cent. Mr. Knox asked if there was any suggestion that the adulteration contained anything injurious to health. Mr. Ricketts replied there was not. The case was that there was grease of some sort, not butter. Mr. Flegg said the defendant had bought the butter in the State he sold it from a firm in West Smithfield. The practice of the firm was to send to customers a man with a van. It was impossible for the defendant to make an analysis on the spot of butter sent to him as he wanted it for immediate sale. He was in the habit, however, of applying at once a particular test by inserting a knife, and when the knife was withdrawn, if fat adhered to it the butter was held to be good butter. The defendant applied this test and found it, as he supposed, to be good butter. He asked the man who came with the van for good butter, and the man said the butter he gave him was good. As soon as he knew he was to be summoned, he wrote to the firm who supplied the butter, Messrs. Garstin & Co., West Smithfield. The answer he received was to the effect that they did not sell such goods as butter, but as "bosh." The defendant had done all he could be fairly expected to do in testing the butter, and that the wholesale dealers ought to be the persons summoned. Mr. Ricketts said the defendant had not protected himself as he might have done by a warranty. Mr. Flegg said a warranty was not given with foreign butter. John Brown, the defendant's foreman, said he bought the butter in question of a man named James Franklin, in the employ of Messrs. Garstin & Co., West Smithfield, and on testing it in the usual way he found it waxy. If butter was of inferior quality it would be found "sticky" when rubbed between the fingers. Before completing the purchase he asked Franklin if the butter would stand the test, and Franklin replied quite indignantly, "Stand the test?—yes;" and he then bought the butter at 115s. per cwt. and sold it at 14d. per lb. They got more profit on good butter than on bad or inferior butter. Replying to Mr. Ricketts, witness said the best fresh butter was sold at 2s. per lb. This butter was salt, and the best Dorsteshire salt butter sold for 1s. 6d. per lb. The defendant, on being sworn, said he had been in business about seven years. The man who bought the butter in question asserted that it would stand the test, and it did so. It was more to the defendant's interest in the way of profit to sell real butter than bad butter. He never had a guarantee from Messrs. Garstin and Co., and they never would give one. Mr. Ricketts reminded the defendant of the printed notice he had stuck on the butter—that a warranty would not be given. The defendant said a person came round to shops with printed labels, and he bought some. He had never taken any butter he bought to the analyst to be analysed. Mr. Knox thought it was asking him too much to say that a man who had been in the trade for seven years did not know what he was buying. He did not mean to say a man in trade was bound to know everything at once, but the defendant, if he had doubts, ought to have taken the butter to the analyst without delay. The public looked upon the retail dealer as responsible for the quality of the goods he sold. The defendant was fined £5 and costs.—Mr. Abraham Hunt, 41, Goodge Street, was summoned for a similar offence. The certificate of the analyst stated that the adulteration matter was 80 per cent. The defendant said the butter was just as he recived it from the wholesale dealer in the City, and he had placed a notice on the butter stating that it was adulterated. Mr. Knox fined the defendant £5 and 2s. costs.—*The Times.*

THE ANALYST.

THE SOCIETY OF PUBLIC ANALYSTS AND ITS CENSORS.

The following four extracts—three from the *Local Government Chronicle* and one from the *Medical Examiner*—will probably be read with some amusement.

It will be seen that according to the same authority, on the 2nd instant the Society was in a state of "disintegration" and "dissolution," that on the 16th it had so far improved that our contemporary was enabled to state that it would "still continue its course of usefulness," but unfortunately by the 23rd it had suffered a relapse, and was again in a state of "disintegration."

It is difficult to account for these fluctuations, but we think the notice in the *Medical Examiner* is a sufficient answer to the *Local Government Chronicle*, if any reply were needed, on which point we leave our readers to judge.

LOCAL GOVERNMENT CHRONICLE, *December 2nd*, 1876.

The Society of Public Analysts appears to be in process of disintegration. At a meeting held last week, at Burlington House, on the motion to confirm the minutes of the meeting held at Glasgow, an amendment was proposed and carried to omit therefrom the resolution censuring the *Analyst* journal for an article on Professor Dittmar. This resolution has, it is rumoured, led to the resignation of the president, vice-president, and treasurer, and will, with the dissention of which it is the outcome, it is feared, bring about the dissolution of the Society.

LOCAL GOVERNMENT CHRONICLE, *December 16th*, 1876.

THE SOCIETY OF PUBLIC ANALYSTS.—In reference to a paragraph which appeared in our issue of the 2nd instant, we have authority to state that the Society will still continue its course of usefulness, notwithstanding the secession of certain dissentient members. The Society has during its short existence done good work, and it would be a great pity were its labours to come to an end through a want of harmony or personal ill-feeling. The next meeting of the Council will take place in January, when Dr. Dupré, who has been nominated, will probably be elected president for the ensuing year.

MEDICAL EXAMINER, *December 14th*, 1876.

THE SOCIETY OF PUBLIC ANALYSTS.—The *Local Government Chronicle* of the 2nd inst. contains a paragraph in reference to the above Society, which would appear to be either the result of guess-work or of sinister inspiration, at any rate so far as the probable "disintegration" of the Society is concerned. That certain officers have resigned is, no doubt, true; but that any resolution was passed at the Glasgow meeting censuring the *Analyst* for its remarks on Mr. Dittmar—about whose individual opinion on the matter of butter, it appears to us, a great deal of unnecessary fuss has been made—is, we believe, entirely a mistake. It is not an infrequent, in fact it is an almost inevitable occurrence, that soon after the formation of a new Society it is found to contain certain incongruous elements; and an amount of weeding out becomes necessary. It generally happens, however, that at the right moment the desired end is attained by the requisite number of voluntary retirements; and in this case, if, as we understand, a very distinguished chemist has consented to allow himself to be nominated as president for the coming year, and if, as we also believe, the Council is likely to be considerably strengthened, we may fairly hope that the "dissolution" of this Society, which has already done much good, may, in spite of the secession of three or four of its members, and of the prophecy of our contemporary, not be so very imminent after all.

LOCAL GOVERNMENT CHRONICLE, *December 23rd*, 1876.

THE SOCIETY OF PUBLIC ANALYSTS.—Under this title a paragraph appeared in the *Medical Examiner* of last Saturday, in which a statement in the *Local Government Chronicle* was said to be "the result of guess-work or of sinister inspiration." We readily acquit our usually careful contemporary of intentional discourtesy. The Editor of the *Medical Examiner* can hardly need to be told that the *Local Government Chronicle* does not deal in guess-work, or knowingly admit of sinister inspiration; and the very improper paragraph must have been admitted by an oversight. On the writer of the paragraph it would be idle to waste a word. With any one who could fabricate, or even imagine, such a charge, the *Local Government Chronicle* can have no concern. As to the particular statement at which offence was taken, it is enough to say that we merely repeated what was common talk in well-informed circles, and had, in effect, already appeared in other journals. That a Society from which its president, vice-president, and treasurer, with all their following, had at one stroke, fallen away, had made some progress in "disintegration" it scarcely needed, as the writer oddly supposes, the gift of "prophecy" to determine.

NOTES ON A CLASSIFICATION OF THE CHIEF STARCHES EXISTING IN, OR ADDED TO, ARTICLES OF FOOD AND DRUGS TO FACILITATE THEIR DETECTION.

By Dr. MUTER, F.C.S. *Read before the Society of Public Analysts, November 15th,* 1876.

HAVING at the moment in the press an illustrated work on the starches, specially for the use of analysts, I have thought that a few tabulated hints, read before you in advance of the book, would be useful for aiding the memory of such of my colleagues as have not had the time to make a speciality of microscopy to any great extent. The following table is arranged as a sort of analytical chart, and is such as I have for some years used in teaching microscopy to my students. I do not say, but here and there, granules may be found which do not quite follow my measurements and chief distinctions, but all analysts must know, that it is by the majority of the granules that starches should be judged. The measurements given, are those of such majority, leaving out extremes, which are duly treated of in the forthcoming book. The Table *depends on the use of a* $\frac{1}{10}$ *objective, and a "B" micrometer eye-piece,* which gives a power of about 230 to 240 diameters, and I should like to impress upon all that this extent of enlargement is quite sufficient. Indeed any further power is not only unnecessary, but mischievous, for an analyst's daily use. The arrangement into classes is of course purely one of convenience, but whatever scientific objections may be taken to it, it is at least, so far as I know, perfectly original, and very useful in practice for assisting the memory. The measurements are condensed from those in my coming work, and are the result of the examination of more than 1000 commercial samples. Modified by the extremes, when the book is published, they can be implicitly relied on.*

TABLE FOR THE DETECTION OF STARCHES WHEN MAGNIFIED ABOUT 230 DIAMETERS.

All measurements are given in decimals of an inch.

GROUP I.—All more or less oval in shape, and having both *hilum* and *rings* visible.

NAME.	Shape.	Normal Measurements.	Remarks.
TOUS LES MOIS	Oval with flat ends	·00370 to ·00185	Hilum annular near one end, and incomplete rings
POTATO	Oval	·00270 to ·00148	Hilum annular, rings incomplete, shape and size very variable
BERMUDA ARROWROOT.	Sack shaped	·00148 to ·00129	Hilum distinct annular, shape variable, rings faint
ST. VINCENT DO.	Oval-oblong	·00148 to ·00129	Hilum semilunar, rings faint, shape not very variable
NATAL DO.	Broadly ovate	·00148 to ·00129	Hilum annular in centre and well marked complete rings
GALANGAL	Skittle shaped	About ·00135	Hilum elongated, very faint incomplete rings
CALUMBA	Broadly pear shaped	,, ·00185	Hilum semilunar, faint but complete rings, shape variable
ORRIS ROOT	Elongated-oblong	,, ·00092	Hilum faint, shape characteristic
TURMERIC	Oval-oblong, conical	,, ·00148	Very strongly marked incomplete rings
GINGER	Shortly conical, with rounded angles	,, ·00148	Hilum and rings scarcely visible, shape variable, but characteristic

GROUP II.—With strongly developed *hilum* more or less stellate.

NAME.	Shape.	Normal Measurements.	Remarks.
BEAN	Oval-oblong	About ·00135	Fairly uniform
PEA	Like bean	From ·00111 to ·00074	Very variable in size, with granules under ·00111 preponderating
LENTIL	Like bean	About ·00111	Hilum, a long depression, seldom radiate
NUTMEG	Rounded	,, ·00055	The small size, and rounded form distinctive
DARI	Elongated hexagon	,, ·00074	Irregular appearance and great convexity distinctive
MAIZE	Round and polygonal	,, ·00074	The rounded angles of the polygonal granules distinctive

* *The expression complete* rings, means those in which the entire circle is visible on one side of the *granules, and incomplete when segments of a circle only are seen.* I have limited the number of starches *in the present abstract to 48.*

GROUP III.—Hilum and rings, practically invisible.

Name.	Shape.	Normal Measurements.	Remarks.
Wheat	Circular and flat	·00185 to ·00009	*Very variable* in size, and *very dull* polarization in water
Barley	*Slightly* angular circles	·00073 and a few four times this size	The majority measuring about ·00073 distinctive
Rye	Like barley	·00148 to ·00009	Small granules quite round, and here and there cracked
Jalap	Like wheat	Like wheat	Polarizes *brightly* in water
Rhubarb	Like wheat	·00056 to ·00033 for small	Polarizes between jalap and wheat, and runs smaller and more convex
Senega	" "	·00148 to ·00009	Measurements the only guide
Bay Berry	" "	·00074 to ·00011	Measurements the only guide
Sumbul	" "	·00074 to ·00009	Measurements the only guide
Chestnut	Very variable	·00090 to ·00009	Variable form and small, but regular size, distinctive
Acorn	Round-oval	About ·00074	Small and uniform size distinctive
Calabar Bean	Oval-oblong	·00296 to ·00180	Large size and shape characteristic
Liquorice	Elongated-oval	About ·00018	Small size and shape distinctive
Hellebore (Green or Black)	Perfectly rotund	·00037 to ·00009	Small regular size and rotundity, distinctive
Hellebore (White)	Irregular	·00055 to ·00C09	Irregular shape and faint central depression, distinctive

GROUP IV.—More or less truncated at one end.

Name.	Shape.	Normal Measurements.	Remarks.
Cassia	Round	·00111 to ·00018	Round or muller shaped granules, and faint circular hilum
Cinnamon	Like cassia	·00074 to ·00009	More frequently truncated than cassia, and smaller
Sago (raw)	Oval-ovate	·00260 to ·00111	Has circular hilum at convex end and rings faintly visible
Sago (prepared)	" "	" "	Has a large oval or circular depression, covering ½ nearly of each granule
Tapioca	Roundish	·00074 to ·00055	A little over 50 per cent. truncated by *one* facet, and a pearly *hilum*
Arum	Like tapioca	About ·00056	Smaller than tapioca and truncated by *two* facets
Belladonna	" "		Not distinguishable from tapioca
Colchicum	" "	·00074 (about)	Larger than tapioca, and contains many more truncated granules
Scammony	" "	·00045 (about)	Smaller than tapioca, more irregular, and *hilum* not visible
Canella	Very variable	·00033 to ·00022	Very variable form, and small size the only points
Podophyllin	Like tapioca	About ·00010	Like scammony, but has visible hilum in most of the granules
Aconite	" "	About ·00037	Like tapioca, but half the size

GROUP V.—All granules more or less polygonal.

Name.	Shape.	Normal Measurements.	Remarks.
Tacca	Poly or hexagonal	·00075 to ·00037	Distinguished from Maize by its *sharp* angles
Oat	Polygonal	About ·00037	Larger than rice and hilum visible in some granules
Rice	„	·00030 to ·00020	Measurement using 1-8 or 1-12 inch power, and then hilum visible
Pepper	„	·00020 to ·00002	Ditto ditto ditto
Ipecacuanha...........	„	About ·00018	Some round and truncated granules, adhering in groups of three

Mr. Allen, spoke as to the use of glycerine, versus water, as a mounting medium, and also as to the discrimination between starch of rice, and of pepper. He found that rice lumps, not too much crushed, would polarize well. He had also based the detection on an estimation of the woody fibre, as he had found, that while rice only gives 1 per cent. woody fibre, pepper yields 6 to 8 per cent. of that constituent, and any deficiency thus easily shows adulteration.

Dr. Dupré, spoke as to the ashes of different starches.

Mr. Wigner, agreed with Dr. Muter, as to the great usefulness of the 4-10 power, and also of a contracting diaphragm.

Dr. Muter, in reply, stated, that he was experimenting on the bursting point of starches in hot water, as an additional means for their detection, but he had not yet come to a conclusion on the point. His favourite mounting agent for preservation was, 1 part glycerine, and 2 parts camphor water. He considered that the only really accurate method of detecting rice in pepper, was by measurement, using 1-12 inch objective and a micrometer eye-piece. Day light only should be used for examining starches, and the illumination should always be more or less oblique.

OFFENCES AGAINST THE SALE OF FOOD AND DRUGS' ACT.

Adulteration by Chemists.—Three prosecutions took place at Runcorn against three chemists named Marshall, Speakman, and Brown, for selling milk of sulphur.—Mr. Glaisyer, of Birmingham, defended at the instance of the Chemists and Druggists Trade association.—Dr. Bell, of Manchester, stated that the milk of sulphur purchased from the defendants was adulterated with sulphate of lime 58½ per cent., and in one case 65.—For the defence Dr. Pemberton, of Birmingham, and Dr. Redwood, of London, Editor of the "British Pharmacopœia," were called, and spoke to the general use of milk of sulphur being such that it was much more beneficial when mixed with sulphate of lime.—Messrs. Evans, wholesale druggists, of Liverpool, said they sold thirteen times more milk of sulphur than of the other preparation. Milk of sulphur was known to contain sulphate of lime, and was extensively used by the medical profession. The Bench decided to convict, on the ground that the article was not supplied that was asked for. In each case a fine of £1 and costs was inflicted. Mr. Glaisyer gave notice of appeal in each case.—*Standard.*

Butterine.—Charles Theobald of 20, Regent Street, Westminster, was summoned for that he did on the 20th inst., sell to Owen Williams, an officer of the Board of Works for the Westminster district, an article not of the quality, nature, and substance demanded by the purchaser.—Mr. Warrington Rogers prosecuted.—The evidence showed that the officer, having asked for a pound of butter, was served, and, on his telling the son of the defendant that it was for the purpose of analysis, the reply was that it was not butter, but "butterine," which was not sold as the natural production of the cow.—The certificate of Dr. Dupré, the analyst, showed that there was only 10 per cent. of real butter; the other 90 per cent. was composed of the fat of various animals.—The defendant urged that he ought not to be bound by what his boy, only 12 years of age had said. He himself had been in the shop only 6 days, and had purchased the stock of the outgoing tenant, so that he was perfectly innocent of any attempt at fraud, and any deception lay with his predecessor.—Mr. Woolrych having cautioned the defendant as to his future conduct, recommended the withdrawal of the summons as the defendant had evidently acted in ignorance.—Mr. Rogers accordingly withdrew the summons.—*Daily Telegraph.*

NOTES ON SOME PECULIAR MODIFICATIONS OF ANIMAL FATS, THE RESULT OF FERMENTATION AND DIGESTION OF THE NEUTRAL FATS OF FOOD PRIOR TO AND DURING ASSIMILATION.

By H. C. Bartlett, Ph.D., F.C.S.

During a very prolonged series of analytical experiments, undertaken at the request of the late Dr. Bence Jones, for the purpose of elucidating the principles of the digestion of food, some very curious results have been brought to light. Among others, the partial transformation of the neutral fats into volatile and soluble fatty acids has a direct bearing upon butter analyses, and on that account, may prove of greater interest to the Society of Public Analysts.

In July or August, 1873, I was able to announce in a letter to *The Times*, that butter could be analysed to detect 20 per cent. of adulteration with neutral fats. The presence of foreign neutral fats in butter is usually indicated by palmitic and stearic crystals, but no dependance can be placed upon the microscopic examination, except as affording very valuable occasional hints. The tolerably constant proportion of the so-called "butyrine," in pure butter, has been held to distinguish the unmixed fat of milk from the ordinary neutral fats commonly employed for adulterating butter. The experiments of Messrs. Hehner and Angell, Dr. Muter, and Dr. A. Dupré, have taken the accuracy in estimating this description of adulteration, far beyond the modest pretentions claimed by me three years ago. I must confess, I have now some reluctance in bringing forward all the details of the transformation of neutral fats into volatile fatty acids, because it may be used as a means of weakening the present confidence in being able to state with certainty, that any sample of butter is absolutely pure and unmixed. The actual means of adulteration derivable from my description of this transformation, is however, so unlikely to be adopted, on the score of the expense and skill required, that I have but little fear of the present method of butter analysis being brought into disrepute, or doubt, in consequence. As a matter of fact, we must not assume that all the animal fats of the body, except butter, are composed of varying mixtures of tri-stearate, palmitate, and oleate of glycerine only. On the contrary, I find the fatty components of most of the glands, contain a considerable proportion of volatile fatty acids combined with glycerine. These are, perhaps, not true synthetical reproductions of the glycerides, but as compounds of soluble fatty acids and glycerin, resulting from the decomposition of the natural saponification during digestion, they are almost identical with the similar compounds released from butter by the artificial means now used for butter analysis.*

The analysis of a large number of pancreatic glands taken from pigs, dogs, calves, and other animals, first led to this peculiarity being observed. Indeed, the fat extracted from such glands is very difficult of separation from water by drying, even at low temperatures in the water-bath. The loss of weight is so continuous by the vapour of water carrying off the volatile acids, that no absolutely steady weighings can be taken until the oxidation of the fat just counterbalances the evaporation of the volatile oils. I need not observe, that when this point is reached the whole analysis is spoilt.

* The transformation of neutral fats by fermentation into volatile fatty acids, appears also to be supplemented by an after reaction of synthetical reproduction of the neutral fat.

To estimate the proportion of volatile oil in the fat extracted, I use potash and alcohol for saponification, and decompose with dilute acid, sulphuric or hydrochloric. This being accomplished in a retort, the condenser is luted tight, and the aqueous liquid distilled over until an exact fourth is left. To this, fresh water is added, and the distillation continued as long as the water condensed gives any acid reaction.

A hectogramme of fat produces about five times that amount of a milky liquid, on which, drops of oil and particles of a harder fat float. Baryta water is added to the distillate which is returned to a cleansed retort and again distilled down to about 5 per cent. of its original bulk, after which it is evaporated to dryness in vacuo, at a temperature of 45 C.

The barium salts thus obtained are in triplicate, one series being easily soluble, the intermediate salts less so, and the third somewhat difficult of solution. I have not yet succeeded in separating these, each in sufficient purity from the others, to be able to speak with certainty as to their exact identity with the caprates, butyrates, caprylates, and caproates of butter. The crystallization and resemblance to benzoate of calcium, together with the absence of efflorescence of the second series of salts appear to confirm the presence of caproic acid. The minute crystalline scales like spermaceti, are most difficult of solution, and are, I think, undoubtedly caprates, which after recrystallization leaves the caprylates dissolved in the mother liquor.

A barium salt so highly soluble as to be taken up in 2·5 parts of distilled water is also found, which resembles a butyrate, but differs from butyric acid, when decomposed with dilute sulphuric acid, both in taste and smell.

The total of volatile soluble fatty acids contained in the fatty extract of some glands appears to vary from 4 to 7 per cent., I am, however, under the impression that I shall obtain a larger proportion than this, as there is an evident loss during some processes of the analyses.

Not only is a considerable quantity of volatile and soluble fatty matter to be obtained from the pancreatic and other glands, but the same may be found during the digestion of fat in the intestine, and particularly at the time of absorption. From this I was induced to conclude that the transformation of a portion of neutral fats into fatty acids and glycerin, by the pancreatic and other digestional fluids is the result of fermentation.

We know that the stimulating principles of the pancreatic and other digestive juices are true ferments. These ferments are different to the alcoholic ferment of yeast, being incompetent to their own reproduction by the organised development and multiplication of cells. They are, however, thrown off by the organism of the digestive glands, and resemble very closely that soluble nitrogenous matter discovered in the water in which yeast has been washed after it has been filtered free from any of the cells. Just as the inversive ferment from yeast washings splits up cane sugar by hydration into glucose and lævulose, converts starch into glucose and dextrin, so the neutral fats are split up into fatty acids and glycerin in the presence of water by the soluble inversive ferments of the digestive fluids of the animal body. This only takes place in the presence of the alkaline salts of bile, and only after being worked, with the full fermentative vigour of healthy pancreatic principles.

With these, the neutral fats of food are emulsified to a fineness of globular form exceeding that of milk, and a slight saponification continues to be produced in the intestine, which natural soap is rapidly and continuously decomposed so as to set free the soluble and volatile fatty acids.

Neutral fats were taken and most carefully tested for the presence of volatile fatty acids, none being found. The same fat was given to dogs, which were killed from 6 to 8 hours afterwards, and the fat, digesting and absorbed, was again tested and contained considerable quantities of these soluble fatty matters.

Outside the living animal digestion of fat, a somewhat similar transformation can be accomplished by obtaining the proper description of inversive ferment, and closely imitating the natural processes. Pancreatin taken during digestion and not injured by heat or any admixture will produce an emulsion in fat or oil precisely similar to that in the living body. The preacreatin must, however, be in itself perfectly soluble in water, or the emulsion will neither be permanent nor sufficiently fine to permit of any saponification at a low temperature. This can also be accomplished by the addition of a solution of healthy bile at 45° C., after which, dilute hydrochloric acid liberates traces of soluble fatty acids and glycerin.

It is not necessary, or even advantageous, to use the crude extractive of bile for this purpose, soda, a trace of glyco-cholic acid being equally efficacious if the pancreatic emulsion has been really complete.

A great misconception as to the real characteristics of a true pancreatic emulsion has been entertained by many, and but few appear to have studied the different aspects presented by such an emulsion as is produced on fat by the energetic action of pure soluble pancreatin, as contrasted with the coarse mechanical mixtures of oil or fat and water which are commonly supposed to represent this result of fermentative digestion.

Some seem to think that if a bottle of oil is shaken up with the compounds sold as the active principle of the pancreas, and a yellowish cloud is diffused for a time through the oil, an emulsion has been obtained. So it has, but not the true pancreatic emulsion, which forms an integral portion of the process by which fats are digested and assimilated. From the unvarying result of many hundred trials with the pure, active principles of healthy pancreatic fluid, taken at the time of digestion, I am perfectly convinced that no valuable result has been obtained unless the slightly saponified emulsion formed is as highly refractive of light as milk. The colour may vary, according to the oil or fat used, from a far whiter fluid than the densist milk to the opacity and colour of Devonshire cream; but unless at least the density of the best milk be attained, when a third of water is held in suspension no real pancreatic emulsion has been formed.

The effect of fermenting neutral fats containing none but fixed fatty acids for a lengthened period is invariably to produce still larger quantities of the volatile matters. In such cases they are accompanied by so nauseous a development of putrefactive decomposition, that this alone would preclude the artificial manufacture of fat similar to butter.

As I find other fats in the animal body besides butter to contain soluble fatty acids, and that this transformation of neutral fats can be carried on artifically, Analysts will do well to bear the fact in mind when giving evidence.

CHEMICAL SOCIETY.—*Dec. 7th.*

A colouring matter obtained from the stems and leaves of a well-known exotic plant, the *Coleus Verschaffeltii*, was described by Professor Church. Colein (for such is the provisional name assigned to this substance), is extracted from the crushed stems by means of alcohol, faintly acidulated with sulphuric acid. By filtration and evaporation the crude colein separates in a resinous form, plastic when plunged in water of 50° to 60° C.; it may be purified by solution in a small quantity of strong alcohol, and precipitation by means of absolute ether. Re-solution in alcohol and re-precipitation and washing with water at 50° completes the removal of foreign matters. Very numerous analyses of Colein have been made by the author of the paper, and he has been led to the formula $C_{10}\ H_{10}\ O_5$ for the substance itself, and to $C_{20}\ H_{18}\ PbO_{10}$ for the lead compound. Professor Church is strongly inclined to regard Colein as identical with the œnolin obtained from red wines by Glénard, and with the cyanin, anthocyan, and erythrophyll of other experimenters. Differences in the spectra shown by these bodies may be traced to the presence of other substances, as sugar and saline matters; to the acid, neutral or alkaline re-actions of the solutions, and to the nature of the solvents. The paper was illustrated by a diagram showing the distribution of colein in the stem of the plant, and by the exhibition of various re-actions and absorption-spectra by means of the lime-light.

ON THE ANALYSIS OF PLATING AND GILDING SOLUTIONS.

By Alfred H. Allen, F.C.S.

In Sheffield and Birmingham, where the electro-deposition of precious metals is carried on extensively, the consulting chemist is frequently called on to assay samples of the liquors used for electro-depositing gold or silver. The liquors consist essentially of double cyanides, but it is erroneous to assume that any particular sample will only contain a single heavy metal. Thus, the ordinary electro-plating liquid—consisting chiefly of the double cyanide of potassium and silver ($KCy + Ag\ Cy$), on being acidified, gives a precipitate nearly always more or less coloured pink by cupric ferro-cyanide, the formation of which indicates the presence of both iron and copper in the solution. For this reason also it is impossible to determine the silver as cyanide by adding an acid, and subsequently weighing the precipitate formed, or converting it into metal. In short, the presence of cyanides renders most of the ordinary methods of analysis inapplicable to the assay of silver in plating solutions.

The method I have been in the habit of employing for the determination of silver in cyanide solutions is as follows:—A definite measure of the sample liquid is largely diluted with water, and the whole raised to boiling. Sulphuretted hydrogen is then passed through the liquid, or sulphide of ammonium gradually added. The silver falls as a black sulphide, which filters and washes well, and, according to the books, is free from copper. This, however, is not always the case, while any zinc which may have been present is sure to be thrown down. On this account I never weigh the precipitate, but always treat it further. For a long time I was in the habit of treating it with nitric acid, filtering from undissolved sulphur, and precipitating the silver from the solution as chloride. A more recent and shorter plan, and one which is quite as satisfactory, is as

follows:—The washed sulphide of silver is rinsed off the filter into a flask or beaker, and treated with excess of bromine water, which converts it rapidly and completely into silver bromide.* If any sulphur appear to have separated, a drop of bromine should be added to the residue, so as to ensure complete oxidation. Boiling water is now added, and the silver bromide is washed, dried, fused, and weighed. The high atomic weight of bromine gives this form of weighing silver some little advantage over the chloride.

I have been unable to devise a satisfactory and rapid method of determining, in the wet way, the gold of gilding solutions containing cyanides. The following method, however, leaves nothing to be desired:—A measured quantity of the gilding solution is introduced into a porcelain crucible, and cautiously concentrated; when in a syrupy condition, a few grammes of pure red lead or litharge are added, and the evaporation is continued to complete dryness. There is little or no tendency to spitting. The crucible containing the above residue is covered, and raised for a short time to a moderate red heat. The oxide of lead is reduced by the cyanide present, with production of metallic lead and cyanate, and the reduced metal unites with the gold. The resultant button of metal is separated from the slag, and the gold obtained either by cupellation or treatment with pure nitric acid.

Electro-silvering solutions can be analysed in a precisely similar manner, but of course, in this case, treatment of the rich lead with nitric acid is inadmissible, and cupellation must be resorted to.

The amount of precious metal found in an electro-depositing solution is commonly reported in troy ounces, pennyweights, and grains per pint of solution. Some clients expect to have the excess of solution returned, or else want to deduct its value from the amount of the fee!

ON BIRCH-WATER.

By Otto Hehner, F.C.S.

In Spring few trees exhibit so prominent marks of vitality as does the common birch (*Betula alba*). In March and April the sap rises with extraordinary power and in great quantity, and freely escapes from any wound which may be inflicted on the tree. This juice, Birch-water, is in some parts of Germany allowed to ferment, when it is said to yield an agreeable mild, alcoholic beverage.

Having collected a large quantity of this liquid, I found its chemical composition to be as follows:—

Acidity, calculated as Acetic Acid...	0·0156 per cent.
Total solid residue	1·8255 „
Mineral Matter	0.0646 „

The solid residue included 0·0176 per cent. of Nitrogen and 1·10 per cent. of Glucose, cane sugar being entirely absent. The juice turns the plane of polarisation to the left, 0·2.

* I hope shortly to be able to give an account of some experiments on the oxidation of metallic sulphides by bromine water. I may say now that the precipitated sulphides of zinc, nickel, lead, and silver, are almost instantaneously oxidised by bromine water. Sulphides of bismuth, antimony, arsenic, copper, and mercury, are almost as readily acted on. Even sulphide of platinum is completely soluble. I believe I shall shortly be able to point out some instances in which this action of bromine on the metallic sulphides may be very advantageously employed both for qualitative and quantitative purposes.

The mineral matter was composed as follows:—

Chlorine	0·708
Carbonic Acid	20·937
Soluble Silica	0·114
Insoluble Silica	1·530
Sulphuric Acid	7·418
Phosphoric Acid	10·855
Lime	18·825
Magnesia	10·105
Soda	0·939
Potash	29·233
	100·744
Minus Oxygen for Chlorine	0·158
	100·586

The trees from which the juice was collected grew on slaty soil.

BUTTER ANALYSIS.

The Food Bureau of the Leipzig Pharmaceutical Society offers a prize of 300 Mark (£15) for the discovery of a practical and certain method for the detection of the adulteration of butter with other fats. The papers have to be sent without name, but with motto and accompanied by a sealed envelope bearing the same motto, and containing the name of the author, to Herrn. Apotherker Kohlmann, Leipzig, not later than September 30th, 1877. The prize essay is to become the property of the above Society.

Had this Leipzig Society been in the habit of taking in the *Analyst* it would not, we believe, at this time of day, offer a prize for the solution of a question which, for all practical purposes, has already been solved.

OBITUARY—DAVID FORBES, F.R.S.

It is so fully a fact in the daily routine of our lives to recognise the law of mortality, that we peruse the death-records, even of public men, without much emotion; yet there are times when the loss of an illustrious man seems to startle us into the reflection that the greatest benefactors of our race are subject to the common lot of all. Few scientific men will have heard of the decease of David Forbes without experiencing this feeling. It will be remembered that David Forbes was a considerable traveller, that many contributions to geology resulted from his varied wanderings, and that his communications are counted as among the most valuable acquisitions of that science. It is to be deeply regretted that many of his observations remain yet unpublished, and that his premature and somewhat sudden death has left his MS. notes unelaborated. Some of his best work is that which he achieved as mining engineer, while in connection with the Iron and Steel Institute, of which he was Foreign Secretary. He was a Fellow of the Geological, Chemical and Royal Societies. He died at the early age of 49 on the 5th inst., and was followed to the grave by many scientific and other friends.

CORRESPONDENCE.

To the Editor of the "Analyst."

Sir,—In an extract from the Pharmaceutical Journal in your last number, I am credited with having stated that the substance called "Pekoe Flower" was the pollen of the Tea Flower. As I do not wish to claim a distinction not actually my due, allow me to state that my knowledge of the article dates sometime previously to the special importation named; that it was first sent to me as being the pollen of the Tea Flower; and that a microscopic examination at once disposed of that error, and identified it with the hairs of the young leaves.

It is always found, in more or less amount, after bulking Pekoes, and can be obtained,—mixed with much dust and dirt,—in almost any London Tea Warehouse, on the beams or projections of the walls.

I am, Sir, yours obediently,

THE CUSTOM'S ANALYST.

SOCIETY OF PUBLIC ANALYSTS.

The next meeting will be held on January 17th, 1877, in the Rooms of the Chemical Society, Burlington House, Piccadilly, when Officers and Members of Council for the ensuing year will be elected, and a new member will be ballotted for, after which sundry chemical papers will be read and discussed.

The members and their friends, will, subsequently dine together at the Café Royal, 68, Regent Street.

THE ANALYST.

THE ADULTERATION OF PEAS.

On another page we reprint from *The Times* a report of a case in which an importer of foreign provisions was summoned before Mr. Knox, on a charge of selling preserved peas which were adulterated with copper, and consequently injurious to health.

The case presents several unique features which render it desirable that we should draw attention to it, and in doing so we must point out that we have no special report of our own, but rely upon that published in *The Times*.

We note first that the defendant was charged with selling peas which were so adulterated as to be consequently injurious to health. This seems to us to have been an absolutely unnecessary and even unwise step to have taken under the circumstances. The mere fact of the adulteration is sufficient for the summons in a case of this kind, and evidence that the adulteration is injurious to health can be given at the hearing, the addition of the last clause to the summons can only have the effect of increasing the penalty, which it is in the power of the magistrate to inflict, and generally introduces some technical difficulty.

The next point which claims our attention is the fact that a medical man, a Fellow of the Royal Society, should have appeared for the defence, and endeavoured to convince the magistrate that the adulteration of peas and preserved fruits with copper was not injurious to health. His argument appears to be based upon such a fallacy that it seems strange it should be listened to even for a moment. It is perfectly true that copper is found in minute traces in the human body, and Dr. Pavy thought fit to base upon this fact, an argument that copper might be legitimately used in the preparation of peas for human food. It appears to us that it would be equally rational to argue that because the human body contains seventy per cent. of water it is therefore legitimate for a milkman to add seventy per cent. of water to the milk which he vends for sale, or that because the human body contains minute traces of alumina it would be perfectly legitimate and justifiable for the baker to add alum to the loaf with which he supplies us.

The special pleading of Dr. Pavy, and the clever Counsel by whom he was put forward had however its desired effect, the magistrate was so puzzled by what he called the widely different opinions of medical men, and was so greatly impressed with the importance of the case to the "trade," which he said would be "seriously affected," that he adjourned his decision, in order that he might fully consider the evidence, and expressed a hope that one result of the adjournment would be to induce qualified persons to discuss the question in medical circles and give him the benefit of their deliberations.

We have carefully considered the question, and we have no hesitation whatever in giving Mr. Knox the benefit of our deliberations, by saying unhesitatingly that the *smallest* admixture of copper when contained in any preserved article of food, ought to be viewed as an adulteration.

It is well known that the copper is added solely for the purpose of improving the colour of the preserved vegetables, and so giving a fictitious value to an otherwise inferior article.

SOCIETY OF PUBLIC ANALYSTS.

Extraordinary Meeting at Burlington House, Piccadilly, January 17th, 1877.

This Meeting was called by the Council for the purpose of proposing the following resolution :—

" That the constitution of the Society as printed, be changed by altering the word 'two,' in the last line but two of the second page, to the word 'three,' so as to make the clause read thus—

" The affairs of the Society shall be managed by a Council consisting of the President, *three* Vice-Presidents, the Treasurer, and two Honorary Secretaries, and not more than twelve other Members, five to constitute a quorum."

The resolution for this change was carried unanimously.

After the Extraordinary Meeting an Ordinary Meeting was held, which was numerously attended, Mr. Heaton was voted to the Chair.

The minutes of the last meeting were read and confirmed.

The following Report of the Council was read, and it was resolved that the same be adopted and circulated among the Members.

REPORT OF THE COUNCIL.

In consequence of the recent resignation of the President, it becomes the duty of the Council to submit a resumé of the proceedings of the Society during the past year.

They have to announce with regret the withdrawal from the Society not only of the President, but also of one of the Vice-Presidents, and of the Treasurer. Besides the secession of the gentlemen just referred to, seven other members have resigned during the year, the reason being in most of the cases that they had ceased to hold the office of "Public Analyst," and consequently considered their further connection with the Society unnecessary. On the other hand the Council have to report the accession of fourteen New Members and of seven Associates.

During the year the number of original papers read before the Society has been twenty-two, besides which nine others have appeared in *The Analyst*, which is receiving increased recognition both at home and abroad, as a scientific journal, and is attracting subscribers outside the Society.

This paper not having been in existence a full year no accounts are now presented, but a balance sheet will be submitted after the expiration of its first twelve months' career, when the question of the further conduct of the paper and its connection with the Society will be considered and decided upon.

The Council believe that the papers which have appeared have afforded much interesting information to members of the Society, both on processes of analysis and on the constitution of various substances, but it is to be regretted that though the number of contributions has been large the names of the contributors have been few. It is therefore hoped that in the present year a much larger number of members will feel it their duty to contribute something to the common fund of information.

The Sale of Food and Drugs Act has been carried out with fair success during the past year. There has been an agitation amongst its opponents to get some alterations

made, with a view of rendering the Act even less of a protection to the public than it is at present, and should this attempt be made your Council will do their utmost to prevent any such alteration.

It appears that the question of the purity of the Drugs supplied to the Public may be considered in the next session of Parliament, and in such case, your Council will be prepared to give all necessary attention to the subject.

The accounts as passed by the Council were read, and it was resolved to request Messrs. Cleaver and Dyer to audit the same on behalf of the Society, and report to the next meeting.

Messrs. Adams and Hill were nominated by the Chairman as Scrutineers; to examine the ballot papers for the election of Officers and Council for the ensuing year and for the election of a Member.

After examining the papers, they reported that the following had been elected as Officers and Council, viz:

Dr. Dupré, F.R.S., F.C.S., *President.*

A. H. Allen, F.C.S.
A. H. Church, M.A., F.C.S. } *Vice-Presidents.*
Dr. Muter, M.A., F.C.S.

C. W. Heaton, F.C.S., *Treasurer.*

Chas. Heisch, F.C.S.
G. W. Wigner, F.C.S. } *Hon. Secretaries.*

and Messrs. A. W. Blyth, M.R.C.S., F.C.S.
John Clarke, Ph.D, F.C.S.
Alfred Hill, M.D., F.C.S. } *As New Members of Council.*
E. W. T. Jones, F.C.S.
W. W. Stoddart, F.C.S.

The Scrutineers also reported that Mr. R. H. Harland, F.C.S., had been elected a member of the Society.

Dr. Dupré having taken the chair as President, read a paper on "Artificial Colouring Matters in Wine."

Messrs. Cleaver, Allen & Jones took part in the discussion, and Dr. Dupré replied.

Mr. E. L. Cleaver read a paper on the "Adulterations of Oatmeal."

Messrs. Jones, Muter, Allen, Hill, Hastie, Dyer, Church, Thomas, Wigner, Vogan and Dupré took part in the discussion, and Mr. Cleaver replied.

Dr. Muter read a paper on "Salicylic Acid." Messrs. Heaton, Dupré and Bartlett, took part in the discussion, and Dr. Muter replied.

The President thanked the authors of the several papers in the name of the Society, and the meeting then adjourned.

After the meeting many of the members of the Society and their friends dined together, and the unanimous opinion of the members present was in favour of having an annual dinner of the Society in the January of each year.

NOTE ON THE DETECTION OF VARIOUS COLOURING MATTERS IN WINE.

By A. Dupré, Ph.D., F.R.S.

Read before the Society of Public Analysts at Burlington House, on 17th January, 1877.

From time to time the public is alarmed by sensational statements about the extent to which the fraudulent colouration of wines is carried on, and the poisonous nature of the substances alleged to be employed for this purpose. I am strongly inclined to believe that all such statements are gross exaggerations, and shall be greatly obliged to any one who will send me a bottle of red wine, bought from an English wine merchant, which owes its colour to anything else than the colouring matter of the grape. I have not as yet met with a single sample of the kind. These statements, however, having been made, methods for the detection of foreign colouring matters in wine have to be devised, were it only to allay the fears of the public.

At the meeting of this Society in January last, I read a short communication on this subject. I then showed that, whereas the colouring matter of a pure wine is almost incapable of dialysis through parchment paper, several of the colouring matters, said to be employed for the fraudulent colouration of wine, dialyse readily. When carefully conducted the process yields reliable results, but in practice it is open to these objections. It is not possible always to secure parchment paper of the same substance, and the rate at which one and the same colouring matter dialyses through different papers varies accordingly; besides this, most sheets have spots in which the paper is very much thinner than it is over the sheet generally, and if such spots are overlooked they may seriously interfere with the success of the experiment; lastly, it requires great care to avoid the intermingling of the liquids, in and outside the dialyser, by capillary action. To obviate these difficulties I now adopt the following plan. Instead of putting the wine into a dialyser, I put into the wine a small cube of jelly about $\frac{3}{4}$ in. square. (These cubes are made by dissolving 5 grms. gelatine in 100 c.c. of warm water, and pouring the solution into a square flat mould made of paper, of such a size as to yield a plate of jelly about $\frac{3}{4}$ in. thick. From this plate the cubes are cut with a sharp wet knife). After the lapse of from 24 to 48 hours the cube is taken out and washed slightly, and a slice is cut out through the centre of the cube and in a direction parallel with one of its sides. I prefer to cut the slice parallel with the side on which the cube has rested. This slice is now examined either by being placed on a glass slide which is then held up towards the light, or by placing it upon a sheet of white paper. If the wine was pure the colour will be confined almost entirely to the edges of the slice, or will not have penetrated more than from $\frac{1}{16}$ in. to $\frac{1}{8}$ in. into the jelly. The case is widely different if any one of the colouring matters given below, under group *b*, was present. It will then be found that the colour has penetrated more or less deeply into the jelly, frequently to the very centre, and may, in many cases, be recognized by its characteristic colour, which is more distinct in the jelly than it was in the wine. Thus rosaniline imparts to the jelly a beautiful red colour, a somewhat similar colour is imparted by the red colouring matter extracted from beet-root and red cabbage. Logwood colours the jelly yellowish brown, indigo blue, &c., &c.

In many cases the nature of the foreign colouring matter present may thus be detected by the colour of the jelly. In some cases the slice may be examined spectroscopically with good effect, in the cases of rosaniline, red cabbage, and beet root, for example. In others again the action of dilute ammonia on the coloured slice will yield

characteristic results, such as decolourising the rosaniline slice, turning the red cabbage slice beautifully dark green, the logwood slice dark brown, &c. In the case of logwood and cochineal the ammonia dissolves much colour from the slice, in the case of rosaniline, red cabbage, and beet root, the ammonia remains almost, if not quite, colourless. Similar tests will readily suggest themselves to every chemist. In some cases it might, for example, be found advantageous to add some chemical, such as alum or borax, to the jelly, and to observe the effect which these have on the colouration of the jelly.

Group *a* Colouring matters that penetrate but slowly into the jelly.
Colouring matter of pure wine.
Colouring matter of Rhatany root.

Group *b* Colouring matters that penetrate rapidly into the jelly.

Rosaniline.	Litmus.
Cochineal.	Red cabbage.
Logwood.	Beet root.
Brazilwood.	Malva sylvestris.
Indigo.	Althea officinalis.

An addition of 10 per cent. of any of the colouring matters of group *b*, to a claret of ordinary colour, is sufficient to yield very distinct results, in the case of logwood 5 per cent. is enough, while of rosaniline only 1 per cent. is required. By an addition of 10 per cent. of colouring matter, I understand that $\frac{1}{10}$ of the intensity of colour in the mixture is due to the colouring matter added. I have not been able to procure any of the colouring matter, or of the flower, of the hollyhock (*althea rosea*), said to be largely used in France for the fraudulent colouration of wines. As I find, however, that the colouring matters from Malva sylvestris and Althea officinalis, the flowers of which I obtained through the kindness of Mr. Holmes, of the Pharmaceutical Society, readily penetrate the jelly, I expect that the colouring matter of hollyhock will do the same. I hope soon to be able to continue these experiments with other colouring matters, and should be greatly obliged to any one who would furnish me with any colouring matter, known, or suspected, to be used in the fraudulent colouration of wine.

In conclusion, I would express the hope that some of our members may be induced to take this subject up and give us their experience at some of our future meetings. Any such process can only be placed on a sufficiently wide and secure basis by being tried and tested by a number of workers.

After a short discussion, Dr. Dupré said, in the presence of wine the action of ammonia on various colouring matters is considerably altered, and by itself is an extremely unreliable test, although in conjunction with the spectroscope it sometimes yields good results. I have not as yet examined the colouring matters from elderberries, or cherries, but hope to do so soon. I am also, I am sorry to say, entirely ignorant of the nature of the wonderful test paper lately brought forward by a French chemist.

THE ADMIXTURE OF OATMEAL WITH BARLEY MEAL.

By E. L. Cleaver, F.C.S.

Read before the Society of Public Analysts, on the 18th January, 1877.

In a case recently decided at Hammersmith Police Court, I stated that all samples of oats which I had up to that time examined contained barley in varying proportions, and that, consequently, I did not consider that oatmeal could be obtained free from admixture with barley meal.

This statement has been much disputed by oatmeal manufacturers, and I have, therefore, gone very fully into the matter, and the object of this paper is to point out the real facts of the case as to the actual amount of admixture that may arise from unavoidable causes.

The oats at present in the market may be roughly classed into three divisions: English, Scotch, Foreign; and if these are closely examined, it will be seen that most of the foreign contain considerable quantities of barley, in some cases to the extent of 10 per cent. A few kinds of foreign, such as Russian, some kinds of Swedish, and Archangel oats, however, contain but very little barley indeed. The English also contain barley, but not, on the average, to the extent of more than two or three per cent., whilst Scotch are practically quite free from barley, although a grain may occasionally be met with. The practice of growing an oat crop after a barley crop, doubtless, accounts for some of the admixture, but not to the extent above mentioned; and it must be borne in mind that as barley is, weight for weight, cheaper than oats, there is some incentive to mix the one with the other.

That this is sometimes done there is no reasonable doubt, and I believe that notices have lately been sent to foreign ports, warning shippers against so doing.

The next question that arises is how much of the mixed grain is used in the manufacture of meal?

The greater part of the oatmeal at present consumed is, I believe, manufactured in Scotland, and by tacit agreement between miller and consumer is supposed to be made from Scotch oats; indeed, a glance at the different varieties of oats will at once show the superiority of the Scotch over other oats for the manufacture into meal, as it is very broad in proportion to its length, and has a remarkably thin skin. Towards the middle of the year, however, supplies of Scotch oats begin to run short, consequently increasing the price, and some makers are obliged to purchase other sorts for conversion into meal. The varieties occasionally used for this purpose are the finer sorts of Swedish and Archangel oats, which always contain small quantities of barley, but the amount so introduced into meal cannot be great, never exceeding one or two per cent., and often below that quantity.

I have, therefore, come to the conclusion that oatmeal can be obtained *practically* pure, and that any admixture of barley above one, or at the most, two per cent., is deliberately made for the purpose of cheapness, or obtaining more profit on the sale of the meal.

I now pass to the consideration of the means of detecting barley in oatmeal. A method was published in the *Chemical News*, some time since, by Messrs. Pattinson & Stead, and I think the method to be for the most part very good, but I have found that it is not easy to obtain the meal so evenly distributed under the slide as I could wish, and I also think that the continual rubbing the cover on the slide is apt to cause the barley granules to be moved out from under the cover, and to aggregate just outside its edge, the reason, I suppose, being that they are so much larger than the oat granules. The method I have adopted is as follows:—I take the barley and oats, mixed in the proper proportion, according to the standard required, and pound them well in a mortar. I then separate the husks, and pass the powder through a wire sieve of about 40 meshes to the linear inch. I then dry the powder at a gentle heat over a water bath, and put it

into a stoppered bottle. Five grains of the powder are put into a small mortar, and rubbed with liquid (that used by myself being a mixture of equal parts of Glycerine and Alcohol), for a few minutes, until a smooth paste is obtained. I then add more liquid and wash out into a small measure, and make up to the bulk of ½ a fl. oz. After well stirring with a glass rod, a drop is taken out, placed on the slide, a small glass cover dropped upon it and gently pressed down. The slide is then ready for observation of the number of granules of barley starch which appear in the field. When testing a sample of oatmeal, the meal is treated exactly as stated above, and compared with the standard sample, whence the admixture of barley is easily calculated.

The advantages I claim for the method are, that—

First.—The meal and standard samples are, by drying, deprived of their water, consequently the same weight of substance is taken in comparing samples, which would not be so if not dried, as *oats and oatmeal* contain different proportions of water.

Second.—The danger of rubbing out the granules from the field is entirely obviated.

Third.—The quantity of material under the slide is always constant in different experiments.

The precautions to be observed, are: firstly—to thoroughly pound the material, and take care it all passes through the sieve; secondly—to well stir the liquid before taking out the sample drop, as otherwise, owing to the greater weight of the particles of barley meal, they will subside to the bottom, leaving the supernatant liquid comparatively free from barley. Also care must be taken not to confound the large compound bodies of the oat with particles of barley starch; but if the rubbing with the liquid in the mortar has been properly done, these bodies will all be broken up. They are easily seen by taking an oat grain, cutting out a morsel, and putting it on the slide with a drop of liquid. If a cover is then gently placed on the drop without much rubbing, these bodies will appear all over the field. They are more pear-shaped than barley starch granules, and by rubbing the cover over the slide can easily be broken up, and the field then presents the usual appearance of oat starch.

Dr. Muter said that he had read the evidence of Mr. Cleaver, as reported in the papers, with feelings of regret, as it was just the description of evidence which so greatly tended to bring analysts, as a body, into disrepute; especially when men, without giving proper attention to their subject, too frequently are apt to be pitted against those who have thoroughly studied and practised the matter that may, for the moment, be under discussion. Many of those present, no doubt, had already felt the absurdity of this so-called defence-evidence. Oatmeal was a subject upon which he could speak with some amount of authority, being a Scotchman who was brought up upon that most excellent diet, and having from the first moment of his possessing a microscope made it one of his amusements, even as a boy, to test the quality of the meal he consumed.

The published statements of Mr. Cleaver having apparently made a sensation in the meal trade, he had been called upon to examine lately a larger number of samples than usual, and he could state positively that no sample of genuine Scotch oatmeal ever contained, unless by design, any distinct quantity of either barley or wheat. Of course

oatmeal was a commercial article, and now and then a few granules of foreign starches would appear under the microscope; but they were so few that no analyst would take any notice of them as deliberate impurities. He presumed Mr. Cleaver had led himself into error by examining samples of Russian oats, which are well-known in the trade to be imported for cattle-feeding purposes, and are not suitable for making oatmeal. Most samples of these oats certainly do contain corns not only of barley but of several other cereals, together with seeds of tares, &c., but even in the most unclean samples these few corns would never produce any distinct per centage, such as 15 or 20, in the manufactured meal. It was necessary to be careful in examining any sample of oatmeal to see that one was not deceived by the round masses found in genuine oats, and exactly simulating barley, especially when using lamp light. On the other hand, if an adulteration of barley were really present it is necessary to be very careful, and calls for the employment of great experience. This is owing to the large number of small granules found in barley starch, measuring ·00073, and which have, in many cases, a decided tendency towards a certain angularity that renders them very liable to be confused with the larger oat granules. He would not have much confidence in the ability of many analysts to distinguish barley from wheat in the presence of oats. If, however, by the judicious use of the light and micrometer, the presence of barley be really established, the best criterion to go on for the estimation of the percentage, is the number of granules measuring ·00292 which are found in barley to bear a very constant relation to the ·00073 granules already referred to. In conclusion he believed that his colleagues now present would bear him out in the fact that, given an admixture of say 5 per cent, they would consider it a most decidedly adulterated sample.

Mr. Allen expressed his opinion that Mr. Cleaver had not sufficient evidence to justify him in going into Court to oppose the analysis in question, and Dr. Hill spoke to the same effect.

Mr. Hastie, having thanked the president for being allowed the privilege as a visitor of speaking, remarked that he was much interested in the question, being a manufacturer in Scotland of oatmeal, and a wholesale dealer in London, and he could, with confidence, say that all the oatmeal which he manufactured and sent out was made from the finest Scotch oats that could be obtained. With regard to some remarks which had been made about oats and barley being grown together in some districts in England, such a practice is unknown in Scotland, and the only way in which a few grains of barley or wheat could get into a parcel of oats is from the thrashing machine, which may have been thrashing barley or wheat before the oats, and consequently a few grains of either may have been left in, but the proportion is so small as to be scarcely perceptible. He had had three samples drawn from the bins of oats in his mills in Scotland, two of which he found absolutely pure oats, but the third contained 2 grains of barley in 1,250 grains of oats, and he considered this as pure as they could be produced. To talk of 5, 10, or 15 per cent. as not being adulteration was simply absurd; there was no doubt whatever that a deal of the oatmeal sold in London was adulterated, but the present enquiry would, probably, have the effect of putting a stop to a practice that has been carried on for years.

Mr. Dyer remarked that he had found considerable proportions of barley-meal in oatmeal sold for cattle-feeding purposes. He thought it possible that in some rare instances this admixture might be attributable to the custom which was said to

prevail to a certain extent among farmers in some parts of England, of growing oats and barley as a "mixed crop," the meal from the mixed grain finding its way into the market as "oatmeal."

Mr. A. H. Church had analysed both barley meal and oatmeal, and had examined many samples of the grain of these two meals. The casual weed seeds and barley grains which he had detected in such samples of oats as were used in the manufacture of oatmeal, if not originally below 1 per cent., would be reduced, and are reduced below that figure in the operations subsequent to kiln drying, to which the oats are submitted. He had found Scotch oats to be of remarkably good quality, while the oatmeal made from them, often contained 10 per cent. of fat, and less than 5 per cent. of moisture, when fresh. The speaker had, however, found that the barley-meal used for pig feeding was liable to a serious adulteration with a preparation, known in the trade as "mixing stuff." This substance consisted of ground gypsum, to which from 10 to 25 per cent. of coarse barley-dust or similar products from the cleaning of rice, or oats has been added.

Mr. Thomas said he was connected with agriculture, and thrashing oats by portable steam machines led to a slight admixture with other corn lodged in the machine from a previous thrashing. It should not amount to one part in 10,000, and more than one per cent. ought to be regarded as adulteration.

Mr. Wigner pointed out that it was clear that Mr. Cleaver must have gone into Court with the evident intention of upsetting Dr. Dupré's analysis, if possible, and that such a course was not only unprofessional, but the evidence, as reported, and the paper read this evening showed that the gentleman in question had not made himself fully acquainted with the subject. He, the speaker, had himself examined the samples of oatmeal in question, and was convinced that Dr. Dupré was within the bounds of truth, when he stated the adulteration at 35 per cent. He thought it was extremely to be regretted that a public analyst, whose duty it was to protect the public from adulterations of every kind, should sacrifice his reputation by going into Court for the defence, when no legitimate case for defence existed, and suggested that Mr. Cleaver should write a letter to "The Analyst," stating that having considerably extended his knowledge of oatmeal since the hearing of the case, he is now of opinion that oatmeal *can* be obtained practically free from barley meal.

Mr. Vogan said he thought it useless to go into ingenious theories as to the way in which barley and wheat got mixed with oats before grinding, because all who understood the manufacture of oatmeal were perfectly aware that there is in fact no such mixture to any discernible extent in such oats as are used by honest manufacturers. He would be sorry to say anything unkind of Mr. Cleaver, but he thought that gentleman would have acted more wisely if he had made himself acquainted with the facts before he reported upon the meal. Mr. Cleaver came to Mark Lane, and was shewn round the market by the gentleman who was implicated, and saw many samples of oats, and he stated that he found a large percentage of barley in all of them; this was no doubt true, but unfortunately, the oats he saw were not such as are used for the purpose of making oatmeal. He (the speaker), was an old Mark Lane man, and although neither a chemist nor an analyst, he had been familiar with the use of the miscroscope for many years, and his friend Mr. Hastie asked his opinion upon this subject, and introduced him to Mr. Cleaver when he came to Mark Lane, bringing with him a sample of oatmeal which he pronounced to be adulterated. Mr. Cleaver showed us certain discs, which "he would

stake his life were barley granules." He, (the speaker) took a portion of the impugned sample home, and having made himself carefully acquainted with the appearance of barley starch by polarised, direct, transmitted, and diagonal, light he found the discs referred to, but was convinced that they were not barley at all, but the agglomerated granules always found in oats, Mr. Cleaver had evidently made an error, and he should take some steps to clear himself from the unpleasant position in which he had placed himself.

Dr. Duprè after expressing the pleasure felt by the Society in seeing several members of the corn trade amongst them this evening, remarked that a speaker had alluded to the declaration of the magistrate, which had appeared in some of the papers, that an admixture of 15 per cent., or less of barley meal in the sample in question would be allowed to pass, but that a fine would be inflicted, if more than 15 per cent. were found. Knowing that the sample contained more than 15 per cent., he did not think it worth while to raise any discussion on this point. At the adjourned hearing, the magistrate however stated that this limit of 15 per cent. was not to be taken, as forming in any way a precedent for future cases, for he knew that Scotch oatmeal could be obtained with a much less proportion of barley meal; unfortunately this statement did not appear in the papers. The Society is, however, indebted to Mr. Cleaver for bringing the subject forward this evening, since it has shown that, in the opinion of every one here present, practical men, as well as analysts, anything more than 1 per cent., or at most 2 per cent. must be looked upon as adulteration. He hoped that this unanimously expressed opinion would once for all settle the question, and render a dispute between analysts on this point impossible for the future. In conclusion, he expressed a hope that Mr. Cleaver would follow Mr. Wigner's advice, and write a letter to "The Analyst," stating, that having considerably extended his knowledge of oatmeal since the hearing of the case, he is now of opinion that oatmeal can be obtained practically free from barley meal; Mr. Cleaver owed them he thought some amends, and he could not offer them in a better way than by writing the letter suggested.

Mr. Cleaver, in reply, said that the published reports of the case were so erroneous that he was not surprised at the severe criticisms that had fallen from the several speakers, he would however, give them the true facts of the matter. A corn dealer was summonsed by the Westminster authorities for selling oatmeal adulterated with 35 per cent. of barley meal, and he came to him to analyse a similar sample. This he did, and found that it did contain about 20 per cent. of barley. The dealer then said that it was impossible to obtain pure meal, and in support of this statement accompanied Mr. Cleaver to Mark Lane, where they examined a large number of samples of oats, as imported, all of which contained barley, in one case to the extent of 15 per cent. Whether these oats were used in the manufacture of Meal was not asked by him (Mr. Cleaver), and he regretted not having done so, as it would have saved him great annoyance, still his evidence was correct, as far as it went; but he must acknowledge that the deduction drawn, that oatmeal cannot be obtained pure, is incorrect. With regard to what Mr. Vogan had said, he thought there was some misunderstanding on that gentleman's part, as he (Mr. Cleaver) merely told him that there were a few barley granules to be seen, but not to a great extent, and he had since told Mr. Hastie that it was under 1 per cent. He did not think that there was any chance of his having made a mistake, especially as regards confounding the compound bodies in the oat with barley starch, as he had particularly mentioned those bodies in his paper.

NOTE ON A SIMPLE METHOD FOR ESTIMATING THE VALUE OF COMMERCIAL SAMPLES OF SALICYLIC ACID AND ITS DETECTION IN MILK AND SIMILAR ORGANIC SOLUTIONS.

By Dr. Muter, F.C.S.

Read before the Society of Public Analysts, at Burlington House, on 17th January, 1877.

Being called upon to estimate the purity and value of several samples of commercial Salicylic Acid, and not having seen any process as yet published for that purpose, I was led to adopt the following colorimetric method, by which I find it possible to detect and correctly estimate ·1 millegram. The necessary appliances are; (1) A standard solution of pure acid; (2) A weak solution of neutral ferric chloride; and (3) the usual tubes and burette as used for nesslerizing.

1. *Preparation of the Standard Acid.* Some of the purest commercial acid obtainable is first perfectly purified by dialysis and recrystallization, and the pure and bold crystals thus obtained, are kept for use, after properly drying. One grm. of the chemically pure acid is dissolved in a litre of water, and a solution is thus obtained, each c.c. of which represents one millegram of Salicylic Acid.*

2. *The Indicator* is a very weak solution of pure neutral ferric chloride, of such a strength, that 1 c.c. added drop by drop to 50 c.c. of the standard acid, just ceases to give any increase in intensity of colour before the addition of the last drop or two.

3. *The process.* One grm. of the commercial sample (after well mixing) is dissolved in 1 litre of water, and 50 c.c. is put into one of the nessler tubes. To this, 1 c.c. of the ferric solution is added, and the colour observed after standing for five minutes. As many c.c. of the standard acid as may be judged necessary are introduced into another tube, made up to 50 c.c. with water, and the 1 c.c. of ferric chloride added. If after five minutes the colours agree, then the experiment is finished, if not, it must be tried again exactly like nesslerizing. The number of c.c. of standard acid used indicates of course the real amount of Salicylic Acid present in the sample. The colour deepens very distinctly indeed for each $\frac{1}{10}$ c.c. of the standard acid. To ensure perfect success, all mineral acids must be practically absent. The colour is affected at first by the presence of *small* quantities of acetic acid, but by standing for ten minutes instead of five it recovers itself. I am now experimenting to see what substances affect the colour, and hope to be able to give a full list shortly, but in the meantime I find that the presence of neutral mineral salts generally does not interfere, provided they are such as have no action on the iron. The presence of certain albumenous bodies, notably casein, and the soluble albumenoid of milk causes the colour to become reddish and bad for estimation, but these can be thoroughly eliminated as hereafter described.

Detection of Salicylic Acid in Milk, Beer, &c. The march of chemistry has caused quite a trade to spring up in tasteless antiseptics, which may be added to milk, (hitherto

*Note.—When intended for use in the analysis of milk, this solution had better be made in grains, (*i.e.*) 10 grains in 10,000 grains water.

without detection) so as to cause it to keep sweet for a day or two. The two articles at present sold for that purpose are Salicylic and Boracic Acids, and the quantities added are, of course, so minute as not to appreciably affect the total solids. I have found that both may be easily separated from the milk by dialysis, and then made manifest. In the present paper I have taken the Salicylic Acid first, and leave the detailed consideration of the boracic acid till a future meeting, as although I can *qualitatively* prove its presence by dialysis; I have not yet succeeded in finding a process of even approximate estimation sufficiently delicate and convenient for the small traces with which we have to deal. To proceed therefore with the former antiseptic:—I take four ounces of the milk or beer and dialyse for twelve hours on a pint of distilled water, at the end of that time I take half-an-ounce out from the dialysed liquid, place it in a narrow tube, add a little of the ferric chloride solution, and look down over white paper, if no violet colour be produced, the milk is pure, but if it be tinged, then the dialysis is to be continued for 48 hours. In practice, I find that working with the usual small quantities added to milk, 48 hours is sufficient to fairly equalise the amount of acid, both inside and outside the dialyser, so that on taking a portion for estimation, and calculating to the total amount of fluid, I have never got back less than 86 per cent. of what I put in, even under the worst circumstances. If the presence of the acid be proved, and an attempt at estimation thus rendered necessary, four ounces of pure milk should be put on to dialyse, so as to give a comparison liquid. This is required because if the milk in the dialyser should go very sour, the colour with ferric chloride will be rendered more reddish, and will not be fairly comparable with the standard. The estimation is to be conducted by the colorimetric method already described, using instead of distilled water, the dialysed fluid from the pure milk or beer.

I cannot say at present exactly the degree of accuracy I can claim for the *quantitative* process as I have not yet experimented in hot weather, or with a great variety of parchment papers, but I may say that I have up till the present got back, as a rule, from 50 to 60 per cent. of the acid put in, after 24 hours, and about 90 per cent. in 48 hours. In the meantime the process is excellent from a qualitative point of view, while it can be said in favour of the estimation, that at all events the quantity cannot be over stated, and that is an important point for public purposes.

Dr. Dupré remarked that the question whether the addition of salicylic acid to milk is, or is not to be looked upon as an adulteration, is one which cannot be decided off-hand.

On the one hand, assuming that such addition really preserves milk, some milk becomes valuable, which would otherwise have been lost; the public is so far a gainer.

On the other hand, assuming the efficiency of salicylic acid, it will enable the dairyman to carry on his business in a more slovenly and careless manner. He was of opinion that the chief cause of the early turning of milk was carelessness in washing out or scouring vessels which were to hold the milk. Cleanliness is at present essential in every part of a dairy, but with the use of salicylic acid, this becomes more or less unnecessary, and sweet milk would be no longer a guarantee that the dairy is cleanly conducted; on this account, he felt strongly inclined too look upon the presence of salicylic acid in milk as an adulteration. Be this however, as it may, the Society was greatly indebted to Dr. Muter for giving a ready means for its detection and estimation.

Dr. Bartlett, who was not present during the reading of the first portion of the paper, observed that he was delighted to hear that progress had been made in the detec-

tion and possible estimation of boracic and salicylic acids in milk. He had encountered both during his somewhat large experience of different samples of milk, representing over 4,000 gallons daily. When either of these acids is used in minute quantities only, it is slightly antiseptic, and prevents for some short time the further development of lactic acid ferment germs. If, however, the germs are present in large quantities, or are derived from that advanced growth proceeding from the vigourous lactous fermentation, often taken up in the use of uncleansed utensils, neither boracic nor salicylic acid is able to stop the rapid increase of acidity, even if employed in large proportions The more minute quantities are, therefore, more to be suspected.

Dr. Muter's plan of dialysis appears admirably suitable for the separation of the serum of the milk from the solids, so that the solution of salicylic salts may be concentrated, until it gives the well-known characteristic reaction of forming an inky-blue precipitate with persalts of iron, the colour disappearing on the addition of free hydrochloric acid.

In reply to a question from Dr. Muter, Dr. Bartlett replied that he was only acquainted with one delicate test for boracic acid, and that was by forming nitride of boron, which gives a peculiar colour reaction to a solution of sulph-amido-benzoic acid.

CORRESPONDENCE.

To the Editor of "The Analyst."

Sir,—It will perhaps interest some of your readers to learn that two or three years ago a Patent was taken out in America for the conversion of ordinary fat into butter, by precisely the same agencies as are described in the valuable paper of Dr. Bartlett, in No. 10 of *The Analyst.*

Fat of the cow, according to the Patentee, is transformed into a substance resembling butter, by simply digesting it at a blood heat for some length of time with pig's or calf's stomach.

If the time of digestion be regulated by analysis, there seems to be every reason for believing that a fat may thus be produced, identical with natural butter fat. As little as we are able to distinguish between, say natural and artificial urea, so it would be impossible to discriminate between natural and artificial butter fat.

I am, &c.,

25th January, 1877. OTTO HEHNER, F.C.S.

To the Editor of "The Analyst."

Sir,—In the published reports of a case of oatmeal adulteration lately decided at Hammersmith police court, I am reported to have said that oatmeal always contained barley meal to the extent of 15 per cent. or under.

I need hardly say that the accounts are erroneous, and, as I have been asked by several members of the Society of Public Analysts why I made such a statement, I think that some explanation in your columns would be desirable.

What I said was as follows :—

That I examined a large number of samples of oats as imported, and every one of them contained varying quantities of barley in one case to the extent of fifteen per cent.

The difference between the two statements is very great, and a glance at the paper read by me at the meeting of the Society of Public Analysts, will I think be sufficient to show my opinion on that subject.

I am, &c.,

18th January, 1877. E. L. CLEAVER.

To the Editor of "The Analyst."

Sir,—The substitution of salicylic acid for bisulphite of lime by brewers to prevent secondary fermentations is rapidly becoming the fashion. German acid is imported at a low rate, some brewers using fifty pounds worth in a month. Its detection is but a simple matter.*

Is salicylic acid an adulterant in beer, and further, what is beer legally understood.

I am, &c.,

EDWARD MOORE.

Brighton, *20th January*, 1877.

To the Editor of "The Analyst."

Sir,—Having resigned my appointment as Food Analyst for this County, in consequence of increasing professional work, I would call the attention of those Public Analysts who are so usefully devoting their whole energies to their special department —to the subject of the adulteration and impurities of drugs.

That this is a matter of pressing importance is the painful experience of the whole medical profession—and more particularly that branch of it whose prescriptions are at the mercy of any struggling dispensing chemist, whose drugs are necessarily obtained in the cheapest market.

Many London Physicians direct their patients to go to some particular druggist, and even to ask for an especial dispenser by name, surely, sir, a sufficiently significant fact as regards "town" drugs! What then is the condition of the country shops? We know that there is such an article as a town-hat and a country-hat, although issued by the same firm,—and we have some reason to believe that a similar variety obtains in the matter of town and country drugs.

Shortly before the much lamented death of my friend Dr. Anstie, I was in correspondence with him on the subject of "*Country Bismuth*," out of a large number

* Note.—The detection of salicylic acid in beer is rendered simple by the process detailed in our present number, but we are not aware that any process for this purpose has previously been made public.

Editor, "The Analyst."

of samples of Trisnitrate, obtained from "Chemists" in various towns in the midland counties, almost all contained *arsenic*—and some to an alarming extent—now although this substance is *only* present as an *impurity*, I have personal knowledge of a case where the administration of Bismuth produced symptoms of arsenical poisoning, and its presence was subsequently confirmed by analysis. If considered only from a *medico-legal* point of view, to what important results might not this subject lead! I am aware that many other mineral drugs contain arsenic as an impurity, but take bismuth as a type.

Poisoning by arsenic, in continued moderate doses produces symptoms that have in certain cases been mistaken for those of typhoid fever. Bismuth has been administered as a remedy! Mary Cotton, at the Durham Assizes not long ago, would have undoubtedly escaped by this loophole, had not her victims been too numerous, and other evidence too clear against her.

This line was suggested to the Counsel for the defence; the medical witnesses stated that the cases *were* treated for typhoid, and *had* taken bismuth; the expert, Dr. Scattergood, of Leeds, said that bismuth did frequently contain arsenic, but only in small quantities; still, *pari passu*, this would have accounted for the presence of arsenic in the exhumed bodies, in many cases a sufficient evidence in favour of the accused.

But it is not only mineral drugs that demand the attention of Public Analysts, a wider and more difficult field looms to the front, viz., our tinctures, "as one star differs from another star in glory," so does one sample of *Tinctura Aurantii* from another sample of the some *simple stomachic*, and so of other tinctures—of what vile ingredients are they composed? consider the quality of the spirit alone—I have known the simplest *Placebo* produce violent headache after each dose.

Again, take chloroform—how must the revered names of Duncan and Flockhart be abused! sulphuric ether too, and spirit of nitrous ether, and a host of other drugs would amply repay an analytical examination. A few well selected cases would arouse popular attention, and revolutionise, for a time at least, the whole drug trade; at present it is safer to trust to one or two well-known firms—but every prescription that leaves our hands is felt to be an uncertainty, and the burden thus experienced by our profession calls for remedy at your hands—for with your assistance, Mr. Editor, the subject will be carefully investigated by the members of our well organised Society, and then, Sir, I do not doubt the result.

Mr. Allen, of Sheffield, has already done good and courageous service in this field, and it is to him and his fellow-labourers that we confidently look for further and more brilliant results.

Trusting that the importance of the subject will be sufficient apology for the length of this communication.

I am, &c.,

GEO. MAY LOWE, M.D.

Lincoln, *January 8th*, 1877.

RECENT CHEMICAL PATENTS.

The following specifications have been published during the current month, and can be obtained from the Great Seal Office, Southampton Row, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
650	C. Wright	Treating Metallic Ores	6d.
999	E. Solvay	Manufacture of Carbonate of Soda	8d.
1256	W. R. Lake	Manufacture of Gas	6d.
1302	W. T. Carpenter	Ditto	6d.
1337	F. W. Mackay	Manufacture of Ice...	6d.
1499	K. M. L. P. Louttit	Manufacture of Gas	6d.
1619	Spalding and another...	Treating Lye Waste	6d.
1680	T. Bowen	Concentrating Sulphuric Acid	6d.
1697	J. H. Porter	Filtering Water	6d.
1747	H. V. Weyde	Photography	6d.
1782	J. Hargreaves	Manufacture of Sulphate of Soda...	6d.
1783	J. A. Muller	Manufacture of Gas	6d.
1796	W. H. Gilbert...	Distilling Alcohol	6d.
1839	B. Hunt	Tanning	6d.
1851	Simpson and others	Preparation of Alizarin	2d.
1856	D. Esplavier	Artificial Manure	2d.
1865	A. Lloyd	Preparation of Cocoa Extract	4d.
1876	G. Barhandy	Food for Cattle	2d.
1893	Rawson & Slater	Purifying Sewage	4d.
1904	E. Solway	Manufacture of Carbonate of Soda	4d.
1927	H. Deacon	Manufacture of Chlorine	4d.
1930	W. Clark	Treating Sewage Matter	4d.
1977	Downing & Hughes	Paper Pulp	6d.
1998	C. Humphrey	Treating Mineral Oils	4d.
2001	W. M. Browne	Purifying Turpentine	2d.
2000	W. M. Browne	Filters	6d.
2053	Coxeter and another	Surgical Batteries	2d.
2069	W. E. Robinson	Treating Phosphatic Minerals	4d.
2080	G. Bischof	Purifying Water and Sewage	4d.
2147	F. W. B. Mohr	Treating Spent Oxide	2d.
2305	J. Schwartz	Sugar	4d.
2339	W. E. Newton	Treating Refuse or Sludge Oil	4d.
2398	E. Morgan	Milk Powder	2d.
2420	P. Jensen	Treating Nitrated Alkalies	2d.
2501	F. W. Colls	Gas	2d.
2505	E. G. Brewer	Bleaching Wool	4d.
2515	A. Browne	Extracting Essential Oils	4d.
2534	A. M. Clarke...	Black Dye	2d.
2535	A. M. Clarke...	Preparing Bone Black	4d.
2563	Swindells and another	Manufacture of Ammonia	2d.
2591	T. B. Redwood	Manufacture of Gas	4d.
2846	S. Hjerleid	Manufacture of Sulphate of Soda	2d.

A NEW TEST FOR ALCOHOL.

Pharm. Journal, [3] *No.* 336, *p.* 463.

Dr. Ed. W. Davy noticing a deep azure blue colouration as the result of the action of alcohol upon a solution of molybdic acid in strong sulphuric acid, proposes the re-action as a very delicate test for the presence of alcohol. The blue colouration is not confined to ethylic alcohol, but appears to be produced in the same way by methylic, propylic, butylic, and amylic alcohols.

Three or four drops of the molybdic solution are placed in a small white porcelain capsule, heated slightly in the water bath, and then a few drops of the liquid to be

tested are added gently to the acid solution, if alcohol be present, blue colouration appears either immediately or in a few moments.

Dr. Davy especially points out the ready way in which the test detects alcohol in chloroform, and asserts that he has found no chloroform in commerce which did not give the blue colouration. The abstractor would like to remark that he believes a small percentage of alcohol is added to chloroform by the very best manfacturers in order to prevent decomposition, and unless more than 6 per cent. of alcohol be found in any sample of chloroform, it would probably be unwise to report it as adulterated.

A. W. B.

PROSECUTIONS UNDER THE SALE OF FOOD AND DRUGS' ACT.

At Marlborough Street.—Louis Barron, Compton Street, Soho, importer of foreign provisions, was summoned before Mr. Knox, charged with selling French preserved peas which were adulterated with copper, and consequently injurious to health. There were three other dealers summoned, but it was arranged that one should be decisive of the rest. Mr. Jenkins, on the part of the Board of Works, prosecuted; Mr. Edward Lewis, defended. It will be recollected that similar summonses were heard at this Court about three weeks ago, and were dismissed on technical objections taken by Mr. Lewis. It was then arranged, as differences between analytical results were shown to exist, that a portion of the peas should be sent to Somerset House to be examined by the Government Analyst. Frederick Taylor, an officer of the Board of Works, proved purchasing a tin of French peas at the defendant's shop. He told the defendant they would be analyzed, and a portion was left with him. Mr. Charles Piesse, of 303, Strand, analyst said he examined a portion of the peas, and produced some of the copper. He had no doubt that copper was present in the peas. He found the result of his analysis was to discover 0·56 of a grain in a specified portion of the peas. The quantity taken for a continuance would, in his opinion, prove injurious to health. Cross-examined by Mr. Lewis, witness said he was aware that Dr. Pereiera, held that if six grains of copper were repeatedly given it would not be injurious to health; but he did not concur in that view, as the opinion was given before the mode of analysis was as perfect as at present. The Government certificate of analysis was produced. It stated the quantity of copper at 0·31 part of a grain. The analysis of Mr. Piesse showed 0·56 part of a grain. Dr. Evans, District of London Officer of Health, thought that the quantity of copper found in the peas, if taken repeatedly, would be injurious to health. Cross-examined, he said he could not say that a single dose would be injurious, nor could he say how long it would take to affect a person injuriously. Could not show any authority for the assertion that copper would destroy life. Mr. Lewis, for the defence, said what he had to establish was that by no possibility could the quantity of copper stated, taking even the analysis of Mr. Piesse, prove injurious to health, and he was prepared to quote the authority of eminent foreign and English chemists to show that a certain quantity of copper, so far from being hurtful, was a tonic, anti-spasmodic, and actually beneficial to health. Dr. Pavy, F.R.S., of 35, Grosvenor Street, author of a work on food and lecturer at Guy's Hospital, said he was of opinion that 0·31 of a grain of copper would not be injurious to health. If a tin of peas were consumed at once, he was of opinion that no injury to health would result. Copper was found in the human body—in the kidney, the spleen, and the blood. It was one of the natural constituents of the body. Drs. Odling and Dupre found a 20,000 part of a grain in sheep's liver. Copper was found in many cereals and even in the feathers of a particular bird. Nearly all kinds of food if cooked in copper vessels would be found impregnated with copper. The quantity of 0·31 grain of copper might be consumed daily by an adult without injury. If any injury were occasioned, it would arise more from the peas than the copper. Mr. Knox said the question was one of great public interest. On the one hand, if he gave an adverse decision, an important trade would be seriously affected; on the other, if the theory that the peas were injurious to health was correct, the public would be poisoned. It had been shown, on the skilful cross-examination for the defence, how widely medical men differed in opinion. Taking into consideration

the importance of the case, he would adjourn his decision in order that he might fully consider the evidence, and he hoped that one result of the adjournment would be to induce qualified persons to discuss the question in medical circles and give him the benefit of their deliberations. *The Times.*

ADULTERATION AT WIESBADEN.—A miller was recently (Dec. 23rd, 1876) brought before the Wiesbaden Police Court, and charged with having admixed with his flour ground heavy spar, for the purpose of fraudulently increasing the weight of the flour. He was sentenced to three months' imprisonment and £50 fine, with costs.

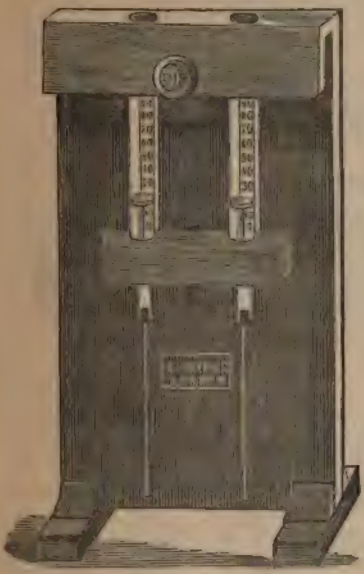
At the Sheriff's Court at Kilmarnock, on the 12th January, 1877, Alexander Mills was charged with having sold a quantity of sweet milk, which was adulterated with 16 per cent. of skim milk.

A Sanitary Inspector deposed that he purchased 2d. of sweet milk, which he told him he purchased, in order to have it analysed by the public analyst. On the same day he took a sample of the milk to Dr. Wallace, of Glasgow, the Public Analyst, he received the certificate produced, showing that the milk contained 16 per cent. of skim milk. He had not previously received any specific complaints in reference to the milk, but met him at his own door as he was coming from supplying his customers, and bought 2d. of milk, he offered the defendant a sample, but he refused to have it, he asked for new milk, there would be about twice as much left.

The defendant was then examined, and stated that his customers were supplied with partly morning milk, and partly night's milk, he never adulterated his milk in any way, he protested against its being a fair sample on account of its being at the bottom of the can. He had previously refused to sell such milk as unfit for sale, and lost money by doing so; it took him from an 1½ to 2 hours to serve his customers, and according to his experience, cream came to the top in less than that time, so that it was gradually skimmed off, he had served customers only five minutes previously, but had had no complaints from them.

The counsel for the defence contended that there was no evidence of the abstraction of the cream. The deficiency was quite sufficiently accounted for by the fact that the cream had a tendency to come to the top of the cans in which the sweet milk was carried. In further support of his argument he quoted an opinion of Dr. Macadam and Mr. Wanklyn, in which they stated that a large percentage of cream would be inevitably abstracted in the way indicated. Sheriff Anderson, in giving his decision, pointed out that the only question was, had it been proved to the satisfaction of the Court that the milk was adulterated, as that was a Court of Law, and not one for an inquiry into scientific subjects, and as the statute in the interests of the public had pointed out a certain way in which articles of food should be shown to be genuine or otherwise, he was bound to take the report of the Analyst, as conclusive evidence of the fact of the articles submitted to him, being genuine or otherwise. He had nothing to do with the opinion of Dr. Macadam or any other person, all he had to do was to be guided by the Analysts' report, and he therefore found the case proved. Under the circumstances he fined the defendant 5s.

We have received from Messrs. Cetti & Co., of Brooke Street, Holborn, a specimen of a new piece of apparatus invented by Dr. E. J. Mills, of the Andersonian University, for the purpose of estimating the relative proportions of colour in different samples of liquids. It appears to be extremely well adapted for nesslerising, and for taking the colours of sugar syrups, and will certainly enable such estimations to be made with increased accuracy.



From the illustration it will be seen that it consists of two graduated tubes, drawn out below, and corked with perforated corks. Through these corks are passed two glass rods, carrying at their upper ends two flat discs of opal glass, like pistons, which fit loosely into the tubes, so as to allow the liquid to pass the pistons.

To use the apparatus the tubes are filled with the solutions to be compared, and the piston of the tube containing the standard solution is set at zero, and the piston of the other tube is then moved up or down, until, on looking down the tubes from the top on to the opal discs, the two solutions appear identical in colour. The position of the piston is then read off, and indicates the relative amount of colour in the liquids.

THE ANALYST.

The present Number completes the first year of the existence of "The Analyst." We are too young to boast, but we hope that we have fulfilled the promises which we held out, not only to Members of the Society, but to our intending subscribers, when we started in April last.

We shall commence the next Number with an enlarged, and, we hope, considerably improved programme, and shall fully announce in that Number all the changes which are to be made.

Meanwhile we may hope that our increased circulation and the quantity of original matter which we are able to put before our readers, will justify us in the position we have taken up.

THE ADULTERATION OF PEAS.

Our readers will be pleased to see, from a Report reprinted on another page, that the article which we felt it our duty to write last month, and the conclusions at which we arrived, have been confirmed by the decisions which have been given by Mr. Knox on the cases before him.

The vendors of several tins of preserved peas in which the Analyst of the district, Mr. C. H. Piesse, had found quantities of copper, varying between a quarter and a half grain, have all been fined, excepting one, and we presume the reason which Mr. Knox had in view in not giving any decision in that case, was simply that the defendant had been put to very considerable expense in preparing his so-called defence, and that, therefore, he had been sufficiently punished. However, from Mr. Knox's statement, that in future cases of the same kind, real and substantial punishment would be inflicted, it is evident that he himself is satisfied as to the correctness of the analytical evidence.

It will be noted with interest that Dr. Guy, Dr. Dupré, and Dr. Tidy, all gave evidence fully confirming the opinion which we so strongly expressed, that articles of food ought not to contain any trace of copper.

SKIMMED MILK.

On another page we reprint an important case of appeal against a conviction for selling milk which had been skimmed.

Our readers will, doubtless, be familiar with the absurd character of the defence usually set up in such cases, and which, unfortunately, has received considerable support from some one or two analysts.

It is quite clear to us, however, that it is as much a milkman's duty to stir his milk before he supplies his customers, as it is his duty not to add water to the milk in the pails, and we are very glad indeed to see that the learned Recorder of Liverpool fully coincides in this opinion.

We hope this will be the last we shall hear of such ridiculous defences.

THE SOCIETY OF PUBLIC ANALYSTS.

An ordinary meeting was held at Burlington House, Piccadilly, on 14th February, 1877.

The minutes of the last meeting were read and confirmed. The auditors presented the accounts of the Society, audited, which were ordered to be printed in slip form, and sent to the members.

The following papers were then read and discussed:

Dr. Dupré, "On Copper as a normal Constituent of the Tissues of Animals and Plants."

Mr. C. H. Piesse, "On Copper in Food."

Mr. A. W. Blyth, "On the Poison of the Cobra."

Mr. Wigner and Mr. Harland, "On the Composition of the White Lead Paint of Commerce."

Dr. Bartlett, "On the Fermentation of Food." ||

THE POISON OF THE COBRA DE CAPELLO,

By A. Wynter Blyth, M.R.C.S.

Read before the Society of Public Analysts, at Burlington House, 14th February, 1877.

The Cobra, from the most ancient times to our own, has been an object of interest, worship, superstition and research.

The lovers of the marvellous have invested the snake with attributes of almost human intelligence. Pliny stated that when a Cobra was killed his companion always sought to avenge his death,† and it has been affirmed that in a house at Negombo, Ceylon, Cobras were kept as a protection against thieves, instead of watch dogs.††

Traces of snake worship still linger in India and Ceylon; the Singhalese, instead of destroying the reptile, deposit it reverentially in a wicker cage, and set it adrift on the nearest stream,* while the dark spirit of superstition, Hecate like, concocts the *cobra tel*, an infernal broth of snake venom and arsenic.‡

It has been stated by Fayrer, that the Cobra destroys in India 20,000 people annually, yet the largest specimen out of 1,200 examined by Nicholson did not exceed 5-feet 8¾-inches in length.

There are two species of Cobra in India, (1) the naja tripudians,‡‡ or spectacled cobra, (2), naja monocellata,§ but no difference in the activity or character of the poison of the two species has been as yet ascertained to exist. The poison itself is secreted by the parotid gland, and when the Cobra bites an animal the venom is expelled through a curved fang, in shape something like a dog's canine tooth, and hollowed or tunnelled like the needle of the modern surgeon's subcutaneous syringe. I send with this paper a fang of the Cobra, and if carefully examined there will be seen, at its base and in front, an aperture through which a very fine bristle may be passed. If this is done, it will be seen that the little tunnel does not occupy the centre but the front part of the fang, while the lower aperture, through which the poison exudes, is on the anterior surface

|| We are compelled from lack of space to hold over some of these papers until next month, but we print part of them.—Ed. Analyst.

† Lib. viii. c. 37. †† Tennant's Ceylon, i. 193. * ib. p. 373. ‡ ib. p. 183.

‡‡ tripudiate, to dance on the toe.

§ Dr. Günther (Reptiles of British India, p. 329), however enumerates eight varieties, and considers them all of the same species.

and not exactly at the apex. So fine is the inferior orifice that Nicholson† found by experiment that a Cobra could not inject its venom through the fang with more force than would be necessary to expel a minim in three seconds. There appears to be no structural connection between the duct of the gland and the duct of the tooth, for the opening of the duct is on the inside of a loose gum. When the Cobra bites its enemy, which it does just like a dog, upon the fang sticking in the flesh, this loose gum is puckered up, the lower orifice of the duct is applied to the upper orifice of the bony canal, so that the two channels then become continuous, and the poison is discharged from the apex of the tooth, whilst at all other times, when the puckering up of the gum does not occur, the poison is discharged like any other saliva into the mouth; hence it follows that the whole secretion in the mouth of a Cobra is poisonous. The poison from the living Cobra is obtained by pressing on the parotid glands while the fangs are erected over the edge of a watchglass or spoon. Dr. Shortt boldly takes hold of the reptile just behind the head with a firm grasp, whilst the free portion of the snake plays and writhes in a chilly and uncomfortable way around the arm. The Cobra cannot, like the viper, bite sideways, so that it is possible, without much danger, for an intrepid experimenter to handle it in this way, and receive the venom ejected in a suitable vessel. This venom oozes out in large drops from between the gum and the fang, and sometimes in a fine jet from the apex of the fang itself.

As thus obtained, it is an amber coloured rather syrupy frothy liquid, of spec: gr. 1·046 and of feeble acid reaction—it dries rapidly on exposure to the air, into a yellow film breaking up into little brilliant yellow granules, which closely imitate crystals.

Mr. Nicholson gives the following statements as the extremes of the quantity secreted by Cobras:—

	Grains.		Solid residue. Grains.
A Cobra gave	8	of poison, containing	1.6
"	7	" "	4.7
"	22	" "	6.6

But the average appears to be 6 grains of poison containing 2 grains of solid matter, hence it would appear that the solid residue varies from 22.5 to 67.5 per cent., but that a little over 33.0 per cent. is the most common quantity.

The yellow powder is very acrid and pungent to the nostrils, and if a little gets in the eye it excites a painful inflammation, which, however, soon subsides. The taste is bitter, and it raises little blisters on the tongue; it is probably poisonous if swallowed in any quantity, for a few years ago a native servant of Dr. Shortt's, in replacing a Cobra in a basket, was bit, and Dr. Shortt immediately sucked the wound, saving the man's life; he himself, however, was seized with alarming symptoms of poisoning, which happily passed away after a few hours.

The poison is perfectly stable, for I have heated a solution of it to 212° F., and yet the uncoagulated portion has preserved its activity. Cobra poison sent to me from India in the middle of 1875, was as active in a year from that date as when first excreted.

The dried residue is very soluble in water, and if the water is added in proper proportions the original fluid is, without doubt, reproduced. The solution usually deposits a sediment of epithelial debris, and often contains little white shreds.

† Indian Snakes, by Edward Nicholson, Madras, 1874.

Dumas made a combustion of the dried poison, and found carbon 46, nitrogen 13, oxygen 25, sulphur 2·5, and the rest hydrogen; and if you put a milk residue into a combustion tube, and express the milk as so many atoms of carbon, nitrogen, oxygen, and hydrogen, the one knowledge is of as little value as the other. The active principle of the Cobra poison is, indeed, as I shall shortly show, a single definite substance, but the product obtained from the reptile is a complex mixture of inert and active substances, which must be separated and identified previous to any numerical statement of carbon and other atoms.

In June, 1875, Dr. John Shortt, of Madras, kindly placed at my disposal a small quantity of cobra poison, and he sent me another small portion in the middle of last year. From that time up till now I have been working intermittently at the subject, both in its physiological and chemical aspects; the former I will bring forward elsewhere, the latter may be interesting to the members of this society.

Of its solubility in water I have already spoken; in other ordinary menstrua, such as alcohol, ether, bisulphide of carbon, benzole, &c., it is only partially soluble.

On heating the yellow granules or powder about 270° C, there is blackening and decomposition, and at temperatures above 270° there is a sublimate under favourable conditions of microscopic needles, this sublimate I obtained and shewed Dr. Shortt, in 1875, but was not then aware of its nature.

On incineration, from 1·4 to 1·5 per cent. of a white soluble ash is left, mainly consisting of chloride of sodium. The aqueous solution of the poison filters readily, and since it contains albumen, it is coagulated by heat, alcohol, acids, and other agents which render albumen insoluble. The albumen is principally serum albumen, but I have reason to believe that there is a small quantity of another variety mixed with the first.

There is a minute quantity of fat always present.

Sugar. glucosides, and alkaloids are absent.

In the latter part of last year, I found that when a solution of the poison was put in a dialysing apparatus, the outer liquid soon became acid, and on injecting small quantities of it under the skin of various animals, the usual fatal symptoms of Cobra poisoning rapidly manifested themselves. On the 1st of January of this year, I succeeded in obtaining a crystalline, acid, extremely poisonous substance, which appears to be contained in the venom to the extent of 10 per cent.; this substance, there is every reason to believe, is the sole and only active principle.

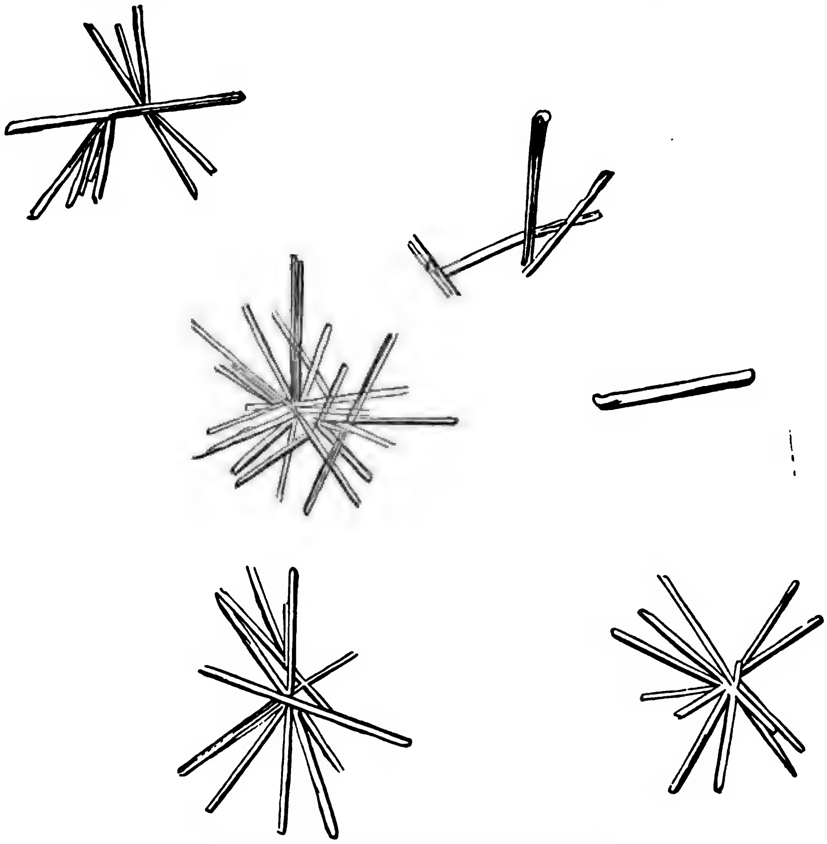
It may be obtained by coagulating the albumen with alcohol, filtering, driving off the alcohol at a gentle heat, concentrating the liquid to a small bulk, precipitating with basic acetate of lead, collecting the precipitate, washing it, and subsequently decomposing it in the usual way by SH_2, removing the sulphide of lead, evaporating to a small bulk at a gentle heat, and finishing the evaporation spontaneously or in a vacuum, or it may be obtained by coagulating and separating the albumen as before, shaking up in a tube with ether, removing the ether in the usual way, evaporating the ether off, redissolving in water and passing through a wet filter to separate fat, and evaporating as before; in either case the result is microscopic needles, dissolving in water with an acid reaction and possessing highly poisonous properties; they appear to be identical with the needles obtained by sublimation.

For this substance I provisionally propose the name of *cobric acid.* I have not been able to go as yet any farther in the investigation of this interesting substance, for the simple reason that my two very small supplies are now exhausted, and I must wait for a third packet, but it will not be uninteresting to pause for a moment to consider what a terribly active substance this *cobric acid* must be, for supposing Nicholson's data are correct, and that the whole of the average quantity of the venom (that is 6 grains. containing 2 grains of solids,) is injected into a man, it then follows, since the solid residue contains 10 per cent. of *cobric acid,* that one-fifth of a grain would be fatal so that we have here a rival to aconitia weight for weight in its power of destruction.

I may add, in conclusion, that as first noticed by Dr. Shortt, a dilute solution of potash added to the liquid poison, or a solution of it, destroys its poisonous properties, and there is very shortly a fine blue colour developed, and after standing, flakes like Prussian blue collect at the bottom of the liquid, while the supernatant fluid is clear.

I find that out of the body a weak solution of alkaline permanganate of potash destroys at once and for ever the poison, and renders it as harmless as water; a wound of course may be washed advantageously with such an agent, but, as might be expected, it is of no use to inject it into the body as a true antidote.

I hope to have further opportunities of continuing the study of the poisonous saliva of the Cobra, and to return to this subject at some future day.



Cobric Acid magnified 250 Diameters.

ON THE COMPOSITION OF COMMERCIAL SAMPLES OF WHITE LEAD.

By G. W. Wigner, F.C.S., and R. H. Harland, F.C.S.

Read before the Society of Public Analysts at Burlington House, on 14th February, 1877.

The white lead of commerce is used chiefly for the purpose of manufacturing white paint, and it is essential that this white paint should possess two distinct although compatible properties, viz.:—1st, the power of covering or laying on to wood, or other substance, in such a way as to cover every atom of the surface painted; and secondly, opacity, or the power of hiding any colour, whether paint or other substance, which may have been beneath the paint thus being applied. Nine-tenths of the white lead manufactured in England, or indeed on the Continent, is made by what is called the Dutch method, that is by subjecting metallic lead to the action of the fumes arising from acetic acid, heated in beds of tan or other similar decomposing organic material.

In "The Analyst" of 30th September last year, we published a paper showing approximately the composition of the gases which were evolved in these stacks, but we did not on that occasion make any reference to the action which these gases have upon the metallic lead. We now propose to take a second step in the consideration of the subject, and to see the character of the compound which is produced; at another time we may consider the way in which the gases act.

Many of the older text books state that the white lead paint of commerce consists of the anhydrous meta-carbonate of lead, but this is practically disproved by the fact that the native white lead ore or cerusite is quite incapable of being ground up with oil to form a paint which shall be of any commercial value whatever. We may, therefore, leave entirely out of the question this native product, and consider only the manufactured article.

Now there are two different ways in which white lead has been manufactured, first, the Dutch process, by which at least nine-tenths of the total quantity consumed is made; and secondly, precipitation, by which a small quantity, certainly not so much as one-tenth is made.

Quoting from Watts, showing as he doubtless does, an epitome of nearly all the published statements on the subject, we find that when the precipitation process is used and an excess of carbonate of ammonia is added to a solution of lead, the anhydrous meta-carbonate of lead is precipitated, while, according to Lefort, the hydrated salt, consisting of hydrated meta-carbonate of lead is thrown down, therefore, according to both these views, the precipitation consists of carbonate of lead anhydrous in the one case, and hydrated in the other case.

H. Rose, however, mentions that the precipitate always contains hydrate of lead, and this is the first time that we find any mention of this compound occurring in any white lead, particularly in that obtained by precipitation, but it is clearly to be noted that the proportions which Rose directs for the admixture of the solutions of salts of lead and carbonate of soda, are not such as to give an excess of the alkaline base, and he further states that the composition of the precipitate thrown down was six equivalents of carbonate of lead and two equivalents of hydrate of lead + one uivalent of water.

Rose also states that, under some conditions, which he specifically details, another compound may be obtained, consisting of five equivalents of carbonate of lead and two equivalents of hydrate of lead; and, under other conditions, another precipitate may be obtained, consisting of three equivalents of carbonate of lead and two equivalents of hydrate of lead; our experiments lead us to doubt both these results.

Watts further goes on to say that "hydrated carbonates of lead are also formed by the direct action of carbonic acid on hydrate of lead, and the compounds thus obtained differ from the precipitated carbonate in being amorphous and perfectly opaque, while the precipitated carbonate is an aggregate of minute, transparent crystalline grains."

We differ entirely from both these statements. We do not believe that the direct action of carbonic acid ever produces hydrated carbonate of lead, but, on the contrary, it produces either an admixture or a slight chemical combination of carbonate of lead and hydrate of lead, both of these compounds, however, preserving most of their original chemical properties; and when the carbonate of lead and hydrate of lead are precipitated in the proper manner, they do possess the characters, or, rather, to speak more correctly, the character, of an amorphous and opaque precipitate, and not "an aggregate of minute transparent crystalline grains."

As the result of the examination of some hundreds of samples of commercial white lead (in all nearly 1000), we must decidedly express our opinion that the material consists not of a basic carbonate, but of a mixture of a neutral carbonate, with a hydrate, and that the value of the white lead as a paint, whether it be prepared by the Dutch process or by precipitation, depends almost entirely upon the relative proportions of these two different ingredients. To put it in general terms, if lead is either by the dry or wet process converted into a hydrate, it is perfectly true that it will combine with oil, and form a kind of paint or varnish, but this paint or varnish, although it will spread over the surface of the wood or other material to be covered, will not really cover it in such a way and with such a degree of opacity as to hide the natural colour of the substance over which it is spread, but, on the contrary, it will appear like a muddy film of varnish or lacquer spread over it; or, taking the other extreme, if the compound, whether formed by the dry or wet process, consists entirely of carbonate of lead, it will form an emulsion with the oil resembling to some extent the emulsion which chalk will form with water or with syrup, and although it will possess a certain degree of opacity, it will not cover the wood or other material in such a way as to render it suitable for paint.

We have therefore come to the conclusion that the combination or mixture of the two compounds, viz.:—carbonate and hydrate of lead, is necessary in order to secure a good and servicable paint, that is the hydrate of lead must be present in order to enable the mixture to form a paint instead of an emulsion, and the carbonate of lead must be present in order to give covering power.

We will consider this subject in two ways—

1st. We have tested samples of pure carbonate of lead and have made them into paint with the greatest care, and have found that although it was possible to spread them over the surface of the substance to be painted, and to secure a certain degree of opacity, the paint never really dried or hardened, or became, in the sense a painter would use the term, a full paint, that is to say, the surface of the colour over which the paint had been

spread was never entirely obscured, and the paint itself, even after some days of drying, was so pulverulent that ordinary washing was sufficient to remove a large portion of it.

2nd. We took commercially pure samples of hydrate of lead and we ground them up into paint in the ordinary way with linseed oil. These samples when so ground possessed comparatively no covering power, that is they spread over the substance painted, and formed a varnish-like film, similar to that which would be formed by linseed oil alone, although with a greater degree of opacity, but they did not really cover or hide the colour beneath. The chemical combination of the hydrate of lead with the linseed oil sets free a certain amount of heat, sufficient to prove that it is really a chemical combination and not a mere admixture or emulsion.

Having experimented on these substances, viz., carbonate of lead and hydrate of lead, separately, we experimented upon mixtures of them in various definite proportions. Our experiments here may be numbered by hundreds, and as the result of the whole, we have come to the conclusion that a white lead paint to be efficient, and to possess both the powers of laying on readily and easily, and by its opacity, hiding the colour beneath, must consist of an admixture of hydrate and carbonate of lead, and that this admixture must be within certain moderate limits in a definite proportion.

The results of the analysis of a very large number of the best brands of commercial white lead show that the percentage composition found, corresponds in most cases with admixtures which are between those limits, and the results of several experiments which we have made, prove to us conclusively that this is the true composition of all the best paints.

Muter in his recent book on "Pharmaceutical Chemistry," appears to have practically hit upon the true proportion, which he puts down as three equivalents of carbonate of lead and one equivalent of hydrate of lead, and this corresponds very fairly to the proportion, which we find by experience is essential to the formation of good white lead paint.

Difficulties connected with the patent law, prevent us for the present stating all the experiments which have led us to arrive at this conclusion, but we may mention one fact—if a sample of ordinary white lead paint of good quality is ground in a mortar, and dilute sulphuric acid added in small quantities from a burette, it will be found that no effervescence is produced until a sufficient quantity of sulphuric acid has been added to decompose all the linoleate of lead present, corresponding to the percentage of hydrate of lead present in the original lead; and that if the mixture be then diluted with warm water, the fatty acids corresponding to the percentage of oil present, will be liberated, and will rise to the surface, and can be separated so as to determine by that means the amount of oil which has been chemically combined with the hydrate of lead. Many other experiments confirm us in this view; having formed this opinion we have made a large number of experiments to determine what proportion of hydrate of lead was most desirable, in order to form a thoroughly good white lead paint, and have come to the conclusion that this proportion should be within small limits of 25 per cent., corresponding to an actual percentage of 12·30 per cent. of carbonic acid, or somewhat less than the percentage of carbonic acid which is found in the average. In these

commercial samples, however, the variation is very great. We have had samples containing as much as 16·33 per cent. of carbonic acid, or as little as 10·39 per cent., and in both these cases the paint, if not useless, would, at any rate, have been of the most inferior quality, and we are not surprised that some of these samples should have been returned as quite useless as paints, although they proved to be perfectly pure white lead, accepting the ordinary interpretation of the term.

The facts which we have brought forward this evening, seem to us to give ample evidence of the reasons why zinc white, carbonate of magnesia, oxyde, and other metallic carbonates and similar substances, have not been able to be used as paints with any degree of success. In the case of the white lead, a positive chemical compound has been formed, and the 75 per cent., or thereabouts, of carbonate of lead present has been dissolved in the chemical compound, and so a paint has been formed which possesses an unquestionable covering power in excess of any other compound known. Until some means can be devised by which oxyde of zinc or some other substance can be dissolved in the same way in a chemical compound, so as to form a paint possessing characters somewhat different from those of a mere emulsion, it seems useless to argue that, as regards durability or covering power, they can equal a good well manufactured sample of white lead, and, still further, while inventors will attempt, in order to increase the yield of paint from a ton of lead, to precipitate the whole of it in the form of carbonate, it is perfectly useless for them to think that that paint can possess a covering power to be compared with that of a genuine article.

Dr. Muter was very pleased Mr. Wigner confirmed him in his view, because at the time he was writing his book he kept it back six weeks on that account, as he was not satisfied with it, but after some trouble and experiments he made out that formula to be the right one, and he was very pleased to be confirmed.

Mr. Dyer asked Mr. Wigner if he had made experiments on the properties of white lead paint mixed with small quantities of baryta, or adulterated about 7 to 10 per cent. with chalk; it did not seem to him to make much difference in paint.

Mr. Harland had examined several samples of white lead manufactured by precipitating oxychloride of lead by a current of carbonic acid. This process appears to produce a very inferior paint. He examined some samples by the manufacturer's test, which was simply to mix a little ultramarine with the paint; this test certainly gave a good indication as to the body of the paint. As to Mr. Dyer's idea of adding baryta to white lead, it not only decreases its power, but makes it apt to wash off; 5 per cent. does not hurt it much, but 10 per cent. does.

Mr. Wigner in reply to a question from Dr. Dupré, said his opinion was that white lead was not a combination of the carbonate and hydrate, but that the carbonate was left totally unchanged. They had taken 75 per cent. of lead, 25 per cent. hydrate of lead, mixed them together, ground them up with 7 per cent. of linseed oil, which made a good thick paint, too thick to lay on with a brush, but adapted for thinning in the ordinary way. If this paint is kept for any length of time the oil does not separate. The same thing occurs if we take white lead made by the ordinary Dutch method, and containing the same proportions. It seemed that the two are identical.

Dr. Dupré said that some time ago he was consulted with regard to antimony paint. It was said that there was some made in London, and in certain books it is stated as being an exceedingly good covering paint.

REVIEW.

THE DIGESTION AND ASSIMILATION OF FAT IN THE HUMAN BODY.*

By Dr. Bartlett.

After such an amusing introduction as this book has in reference to the views of the late Baron Liebig, we naturally turned to the body of the pamphlet with some misgiving. We will, however, say at once, that the substance is better than the introduction. Dr. Bartlett describes some experiments on the digestion and assimilation of fat which, if extended and verified by others, cannot fail to advance our knowledge on this subject considerably. It has been known for a long time that the pancreatic secretion has the power not only of producing an emulsion with fats, but also that of splitting them up into fatty acids and glycerine. Dr. Bartlett now adds this further property, viz: the power of splitting up the higher into lower fatty acids, and thus rendering them soluble in water. It is this latter splitting up which, according to the author, renders the fat capable of assimilating the soluble fatty acids in some way not as yet explained, during their absorption, carrying the emulsified fat along with them. Some experiments described by Dr. Bartlett certainly seem to favour this view, and, as before stated, should it prove to be the correct one, it will mark an important step in advance in our knowledge of the process of the digestion and assimilation of fats. It might be well, however, if Dr. Bartlett furnished us with some of the analytical data on which his conclusions are based, and, if he would, at the same time, state his views with somewhat less verbiage.

RETURNS OF ANALYSES MADE UNDER THE SALE OF FOOD AND DRUGS' ACT.

We are preparing a return of the amount of work which has been done by the Analysts appointed under the Act during the years 1875-6. We have received a large number of returns from the following places :—

M. A. Adams ...	Kent.
A. H. Allen ...	North Derbyshire.
	Sheffield.
R. Apjohn	Cambridge (Borough).
	Cambridge (County).
	Ely (Isle of).
	Huntingdon (County).
W. Baker	Rotherham.
	Upper Swafforth and Tickhill.
J. J. Bancroft	Denbighshire.
T. B. Blunt ...	Shrewsbury.
	Shropshire.
	Mongomeryshire.
J. Brierly	Southampton.
J. C. Brown ...	Lancaster (County).
	Liverpool.
	Preston.
J. H. Collins ...	Cornwall.
M. Corner	Mile End Old Town.
C. Estcourt ...	Manchester.
J. H. Gramshaw	Gravesend.
C. Heisch	Hampstead.
	Lewisham.
A. Hill	Birmingham.
J. F. Hodges ...	Belfast.
G. Jarmain ...	Huddersfield.
E. W. T. Jones	South Staffordshire.
	Wolverhampton.
E. H. Moore ...	Brighton.
	East Sussex.
W. Morgan ...	Swansea.
C. O'Keeffe ...	Cork City.
	Cork County.
W. Procter ...	Beverley.
E. Sergeant ...	Bolton.
W. W. Stoddart	Bristol.
	Somerset.
R. R. Tatlock	Govan.
J. W. Thomas	Cardiff.
J. W. Tripe ...	Hackney.
Wallace, Tatlock & Clark	Glasgow.
Wm. Wallace...	Ayr.
	Kilmarnock.
	Rutherglen.
J. Wiggen	Ipswich.
	Colchester.
	East Suffolk.
G. W. Wigner	Greenwich and Deptford.
	Plumstead.
	Woolwich.

* The Digestion and Assimilation of Fat in the Human Body, by H. C. Bartlett, Ph.D., F.C.S. London: J. & A. Churchill, 1877.

The net result of these returns is that in these 49 districts 6,748 samples have been examined, of which 1,537, or 22·77 per cent. have been adulterated.

Of course the largest number of adulterated articles have turned out, as usual, to be samples of milk.

We hope, next month, to be able to publish the list for the entire kingdom, and to show, in a satisfactory manner, what the working of the Act has been; and shall be glad if all Public Analysts, whether members of the Society or not, will forward us their returns before the 15th of March. We have received a few since the above list was made up which we will acknowledge next month.

Mr. J. Baynes has been appointed Public Analyst for Hull, at a salary of £50 a year, by 42 votes. Mr. Penny received 7 votes.

RECENT CHEMICAL PATENTS.

The following specifications have been published during the current month, and can be obtained from the Great Seal Office, Southampton Row, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
1944	W. T. Henley...	Electric Telegraph Conductors	8d.
2039	W. S. Williamson	A treatment of Slags	6d.
2073	J. Mactear	Furnaces for the Manufacture of Alkaline Carbonates	6d.
2089	A. J. Morrison	Apparatus for Evaporating Liquids	8d.
2124	W. Webb	Separating Sewage	6d.
2143	C. Solvay	Manufacture of Carbonates of Soda	6d.
2285	R. W. Wallace	Manufacture of Sulphuric Anhydride	6d.
2350	J. H. Johnson...	Manufacture of Gas	8d.
2387	T. Lovell	Purifying Sewage	4d.
2620	G. J. Wells	Manufacture of Soda and Potash	4d.
2630	Kingsett & Zingler	Preparing and Applying Albumen	4d.
2632	R. J. Hutchings	Manufacture of Tin, Terne, and Metal Plates ...	6d.
2661	R. Dickson	Dressing, Dyeing, and Coloring Furs, &c. ...	2d.
2677	J. Ireland	Reducing Oxide Ores	2d.
2680	A. M. Clark	Waterproofing Compound for Skins and Leather	4d
2690	Duncan Newlands & Newlands ...	Manufacture of Sulphate of Alumina	4d
2707	Ditto ditto	Ditto ditto	4d.
2737	J. Calderwood...	Utilizing Sulphuric Acid Tar	2d.
2742	Mackie, Faure & French	Explosives	4d.
2748	J. Morton	Preparing Fabrics, &c., for Dyeing or Printing ...	4d.
2793	E. H. C. Monckton	Medicinal Compounds	2d.
2886	J. Dewar	Electro Meters, &c.	2d.
2893	J. Thellot	Treating Petroleum for mnftre. of Candles and Soap	2d.
2923	N. D. Spartali	Apparatus for convrtng. Peat into Coke or Charcoal	2d.
2928	Bickerdike & Bowdler	Manufacture of Varnish	2d.
2938	J. Steele	Apparatus for Purifying Gas	2d.
2950	Wallace & Claus	Manufacture of Salts of Barium	4d.
2951	Ditto ditto	Ditto, &c., of Sulphate and other Salts of Zinc	4d.
2971	J. H. Johnson	Coating Metals or Surfaces with Platina ...	4d.
2973	W. Morgan Brown	Photography in Colors	8d.
3003	R. H. Ridout	Galvanometers	2d.

BOOKS, &c., RECEIVED.

The Miller.
The Sugar Cane.
The American Chemist.
Dr. Bartlett's Digestion and Assimilation of Fat in the Human Body.
The Chemist and Druggist.
The Brewers' Guardian.
The British Medical Journal.
The Medical Examiner.
The Medical Times and Gazette.
The Pharmaceutical Journal.
The Sanitary Record.
The Telegraphic Review.
The Anti-Adulteration Review.
The Medical Record.
The Geological Society's Proceedings.

MILK WITHOUT CREAM.

IMPORTANT APPEAL CASE.

At the Liverpool Sessions, on 24th February, before the Recorder (Mr. J. B. Aspinall, Q.C.,) a case of some importance to milk dealers and buyers was heard, in which the question arose whether the usual method of ladling milk from a large vessel to customers deteriorated the article so as to make it skimmed milk. The appellant was John Simpson, milk dealer, 53, Laxey Street, Toxteth Park, and he appealed against a conviction by the stipendiary magistrate (Mr. Raffles) for selling as new milk, milk from which had been abstracted part of its cream so as to affect injuriously its quality, substance, or nature.

Mr. Segar appeared for the appellant, and Mr. Samuell for the respondent.

The conviction took place under the 9th section of the act, which says that "no person shall, with the intent that the same may be sold in its altered state without notice, abstract from an article of food any part of it so as to affect injuriously its quality, substance, or nature; and no person shall sell any article so altered without making a disclosure of the alteration." The penalty in each case not to exceed £20. The facts of the case were that in January, a person from the nuisance inspector's office purchased at appellant's house, from a female, a pint of milk, asking to be supplied with new milk. The sample was taken to Dr. Campbell Brown, the public analyst, who found that "the milk was skimmed milk, having been deprived of nearly all its cream." The respondent fined appellant 5s. and costs, but said he believed there was no fraudulent intention. Evidence in support of the respondent's case was given.

Dr. Campbell Brown cross-examined by Mr. Segar.—Supposing 18 gallons of milk had been deposited in a vessel at six o'clock in the morning, and customers were served with milk from the vessel from that hour until about three o'clock in the afternoon, when the milk in question was sold would not the milk sold last be very much thinner than that served earlier? Witness: It ought not to be, because every one who knows his business stirs up the milk before taking it out. Mr. Segar: But the act of Parliament does not say we are to do that; Suppose we go upon the principle, first come first served, and each gets his "dollop" from the top, what would be the result then? Witness: I should say the appellant had skimmed the milk in serving his customers. If they do not stir it up but leave the can standing for a whole day, the first customers would get very much more cream, undoubtedly.

Mr. Segar, on behalf of the appellant, said it might appear strange to be fighting about a five-shilling conviction, but it was a matter of very great importance to the appellant, and also to other milk dealers who sold their milk exactly in the same way as the appellant did. The milk was put in an 18-gallon pot, and was sold in the ordinary course to customers as they came for it from time to time. No cream was abstracted from the milk, and if there had been any deterioration it was the result of the cream coming naturally to the top of the vessel and being ladled out to earlier customers, thereby weakening the quality of the milk.

The Recorder.—You say that the fact of selling to customers out of an 18-gallon vessel weakens the milk until it gets to the condition of skimmed milk, and that is so obvious that every milk dealer must know it. Mr. Segar: Yes. The Recorder: If that is so, has he, knowing it, the right to sell the milk in that condition as new milk? Mr. Segar: It is new milk until it has been skimmed deliberately.

The Recorder.—But knowing that the milk was skimmed in this way, do you think he is doing right to go on selling the residuum as new milk? Mr. Segar: Clearly. In the market new milk is new milk from the moment it is put into the can until it has been deliberately skimmed. It must be proved not only that the milk is reduced in quality, but that a portion of it has been abstracted with intent that the same may be sold in its altered state without notice.

The Recorder.—Nobody will convince me that a milk dealer could not, if he liked, take care that each of his customers should get a fair proportion of the cream. Mr. Segar said he would call evidence to show that the milk had never been skimmed, but was sold in the ordinary way, and that in the trade milk which had not been skimmed was considered new milk.

The Recorder said it was unnecessary for Mr. Segar to do so. He was perfectly certain that the milk had not been skimmed, but that it had been weakened by the process of selling to the earlier customers. He was certain that when the appellant sold the milk to the earlier customers he knew he was abstracting the cream from it—not skimming the milk, but abstracting the cream, but with no fraudulent intention. He was equally certain also that the appellant sold the residuum of the milk knowing that it had been reduced to the condition in which it was when he sold it. He was quite satisfied, therefore, that an offence had been committed against the act of Parliament, but at the same time he thought it right to say that he thought Mr. Simpson had not the least fraudulent intention. Mr. Raffles had practically expressed the same opinion, when he only inflicted a penalty of 5s., though he might have imposed one of £20. While he believed Mr. Simpson had been perfectly honest in the transaction, he could not alter his view that the mode in which he sold the milk constituted an offence against the act of Parliament. Mr. Simpson was pursuing, no doubt, what he thought the ordinary course of business, and which was, no doubt, the ordinary, but mistaken, course of business of a great many milkmen. A man had a right to sell to his

earlier customers in any way he liked, but when the milk was reduced by that process to the condition in which he knew it was no longer new milk, he had no right to sell it as new milk. He would, therefore, confirm the conviction, with costs. It might satisfy Mr. Simpson to know that although this litigation had cost him some money, nobody said, and nobody thought, he had done anything fraudulent in the offensive sense of the word. The conviction was then confirmed.—*Liverpool Daily Courier.*

PROSECUTIONS UNDER THE SALE OF FOOD AND DRUGS' ACT.

At the Birmingham Police Court, on 16th Feb., Richard Genge, milk seller, Cromwell Street, was summoned for selling adulterated milk. George Leaton, inspector, purchased at defendant's house a pint of new milk for 2d., which, on being analysed by Dr. Hill, borough analyst, was found to contain 24 per cent. of water. The defendant was fined 20s. and costs.—George Owen, Railway Terrace, Nechells, was charged with a similar offence, the sample containing 25 per cent of water. It was stated that the defendant had supplied the milk to the previous defendant. The defence was that the milk that had been sold to the inspector was some that was kept for a baker for making buns, at 6d. a gallon. A fine of £1 and costs was imposed.—William Jones, Hampton street, was fined £1 and costs for selling to the inspector a pint of new milk adulterated with 27 per cent. of water.

Joseph Day, provision dealer, Hill Street, was charged with adulterating mustard. On the 1st inst. he sold to the inspector 2oz of mustard adulterated with 30 per cent of wheaten flour. Mr. Goodman, a magistrate, said they should only impose a small penalty, as the mixture was not calculated to do any harm, the defendant would be fined 5s. and costs.

Alfred B. Parker, "Leather Bottle" Inn, Digbeth, was charged with selling gin 49 deg. below proof. Mr. Herbert, in opening the case, said that in an appeal case in the Court of Exchequer, before Baron Cleasby and Justice Grove, it was laid down that 20 degrees below proof was the lowest degree at which it was permissible to adulterate gin for commercial purposes. If it was weaker than that it was adulterated. Leaton proved that he bought a pint of the gin for 1s. 8d., and in cross-examination admitted that when he stated the purpose for which he required it, the waitress told him it was not their best gin. Mr. Hebbert, magistrates' clerk, explained that anything said after the sale would not affect the case.—Dr. Hill, the borough analyst, stated that the sample was 49 degrees below proof. He explained that 1 per cent. of alcohol represented two degrees under or over proof as the case might be; the specific gravity of good gin should be 944. The sample was heavier than it should be, gin being lighter than water. Extracting the alcohol, in 100 parts he found that the gin contained 23½ parts of alcohol, the remaining 76½ parts being water. Gin of the specific gravity of 944 would contain 45 per cent. of alcohol, and 55 of water. In cross-examination, Dr. Hill said he was not aware that publicans were not permitted to sell gin unless it was 30 degrees under proof. There was no Excise law or any other law to that effect—nor did he know that they are not permitted to sell raw gin; gin delivered from the distillers was 20 degrees over proof, whereas this sample was 49 under proof, and was the weakest he had ever examined. His authority was based upon cases previously decided in law courts and superior courts. In defence Mr. Bickley urged that it was the first case of the kind that had been heard in Birmingham, and said it was the commonest custom in this town for publicans to sell gin of that quality. The great point in his argument was, whether the gin had been sold to the prejudice of the purchaser, considering that it had been sold at a reduced price and without any stipulation on the part of the purchaser as to the quality of the article required. Mr. Goodman observed that a case in the Superior Court had established a standard for the guidance of the trade. Gin ought not to fall below 20 degrees under proof, while the one before them was 49 degrees. The defendant would be fined 20s. and costs; but it was advisible that the trade in Birmingham should know that if any other case came before them they would be fined more heavily.

Alfred W. Bradley, "Rose and Crown," Lichfield Street, was summoned for selling beer, adulterated with 147·6 grains of salt per gallon. Mr. Herbert said that excise ale was allowed to contain 50 grains of salt per gallon, but here there was almost three times that quantity. The Brewers' Association, a few years ago, took up the question of the adulteration of beer with salt, and the Home Secretary suggested that in cases were the total quantity of salt in beer did not exceed 50 grains, the officers of Inland Revenue need not enquire whether any part of the amount had been artificially added, for the salt might be contained in the water. Dr. Hill said he had analysed large quantities of beer, and as a rule the quantity of salt was very much below 50 grains per gallon, sometimes not more than 7 or 8, while in the sample there was the large quantity of 147·6. Burton ales had about 9 grains of salt. Mr. Bickley admitted that there was the quantity named in the beer. Salt improved beer, and made it keep better. His client sold the beer as he had purchased it from a brewery. Dr. Hill said that he never found beer quite free of salt, but salt was not necessary for the keeping of beer. The best Burton ales consumed in this country, and in India, contained very little salt. He had tested Burton ales that had been brewed more than a month. Mr. Goodman said he regarded this case in a different light to the previous one, as an injurious ingredient had been added to the beer, no doubt wilfully, and fined the defendant £5 and costs.—*Abridged from the Birmingham Daily Post.*

PRESERVED PEAS.

On the 19th inst, at Marlborough Street, the adjourned summons against a number of foreign provision dealers in Soho for selling French preserved peas, alleged to be adulterated with copper, was again before Mr. Knox. Mr. Philbrick, Q.C., attended on behalf of the Strand Board of Works, to prosecute; Mr. Edward Lewis for the defence. Mr. Lewis asked the magistrate to give his decision in the case of Louis Barron, which had been fully argued on the last occasion, before proceeding with the other cases. It was understood that the matter stood over for the magistrate to consider his decision. Mr. Knox said the matter had been practically exhausted in Barron's case; but it would be the better course to take another case, as he understood many scientific persons were now prepared to give evidence. The evidence for and against Barron was so evenly balanced that he should adjourn that case *sine die*, and Mr. Lewis, if he thought fit, could apply for a *mandamus* to compel him to give a decision. Mr. Lewis was not desirous of taking such a course, although he confessed to some disappointment in not having a decision as anticipated. It was then arranged that the summons against another defendant named Delmat should be taken. Formal proof having been given of the purchase of a tin of Eriant's French preserved peas, Dr. Piesse, official analyst for the Union, stated that he had analyzed the sample of peas submitted to him, and found 0·56 of a grain of copper. On the application of Mr. Lewis, the certificate of the Government analyst at Somerset-house was produced. From the certificate it appeared that the quantity of copper found in a similar sample of peas from the same tin was returned at 0·23. Mr. Lewis pointed out that, in the case of Barron, the Government analyst had found much less copper than Dr. Piesse had declared to be present. And in the present case there was a great disparity between the result of the analyses of the Government analyst and that of Dr. Piesse. The summons against another of the defendants, William Lingner, was taken. Mr. Philbrick said the proceedings were taken under the Sale of Food and Drugs' Act, 1875, in respect of a tin of preserved peas sold by the defendants to the inspector appointed by the Board of Works, Strand Union, and which on being analyzed were found to contain copper to the extent of ·088, of metallic copper, equal to 2½ grains of sulphate of copper. The amount of copper might be small, but it was sufficient to be dangerous. Mr. F. Taylor, inspector to the Strand District Union, and Mr. Piesse, analyst to the Strand District Board of Works, gave evidence in support of the summons. Dr. Conway Evans, M.D., medical officer of health, said he had been in practice for upwards of 20 years, during which time he had held several important appointments. He considered that the larger quantity of salt of copper spoken of in a 1lb tin of peas, if eaten daily or repeatedly would be injurious to health, and would produce chronic poisoning, but many persons might eat a quantity of these peas several times without apparently suffering any injurious effects, the period varying in accordance with difference of vigour, age, health, &c. Two or three doses might affect some persons and not others. From 14 to 15 grains of copper was sometimes given as an emetic, and sometimes in ague or chronic diarrhœa ½ to 3 grains were given as a tonic. It was a well-known medical fact that in respect of some poisons—such, for instance, as mercury—certain persons were peculiarly susceptible to their influence, and it was possible that these peas containing copper, if swallowed by persons ignorant of their own susceptibilities, might, even in a single dose or a few doses, lead to injurious consequences. He believed copper was more fatal in a smaller dose than salts of lead. The heightening the colours of preserves with copper was once a common practice. Cases of poisoning by copper were formerly very common, but copper utensils in cooking had given place to tin and iron saucepans. Such cases were of rare occurrence. Pure metallic copper he believed to be harmless, but it was dangerous when in contact with other substances, and when dissolved. In France 20·4 of deaths were caused by copper poisoning. Mr. Philbrick here read the symptoms of chronic poisoning by copper; they were very slow and insidious, as described by Tardieu. Dr. William Guy, M.B., F.R.C.P., and Vice-President of the Royal Society, said that cases of poisoning by copper had occurred in which the quantity swallowed must have been small. He had studied the question of poisons particularly. The fact of a trace of copper in the human body would not prove its existence in a poisonous form. He had made inquiries for Government into the effects of poisoning in certain trades. Palsy followed from poisoning by copper. Two cases had come under his knowledge of poisoning by green paper in a room. The poisoning, in his opinion, came from the copper, not the arsenic. Salts of copper he considered more poisonous than lead. The small quantity of copper contained in the peas in question from France might prove injurious, and slowly undermine health. On a nervous person copper was more likely to produce dangerous symptoms than on anyone else. With regard to the presence of 3·6 of copper, if taken one-third at a time it would not affect a healthy person, and if repeated in small doses it would, in his opinion, be ultimately injurious to health. He considered that any article containing the amount of copper spoken to by Mr. Piesse should not be allowed to be sold for one moment. Sulphate of copper in its virulence ranked fourth in the class of poisons. Dr. Charles Tidy, M.D., Professor of Chymistry and Medical Jurisprudence, and Medical Officer of Health for Islington, gave similar evidence. He had studied poisons, had experimented on fresh peas and pods, and found not even a trace of copper. If copper—that is, sulphate of copper—were constantly taken to the extent of the amount of copper found in the French peas it would be injurious to health. Dr. August Dupré, Ph.D., F.R.S., Lecturing Chymist at the Westminster Hospital, and

President of the Society of Analysts of Great Britain, stated that copper was present in traces only in animal and vegetable tissues. The quantity of copper found by Mr. Piesse was far beyond that quantity normally in any vegetable. Dr. Guy said he considered the sale of an article containing such a quantity of copper as that found in the French peas ought not to be tolerated. Small doses of copper were more dangerous than large ones, as the latter would cause vomiting. The defendant said the peas were sent to him as quite natural peas. Mr. Jenkins said the defendant had been convicted of a similar offence. Mr. Knox said that, having been informed that the defendant has been before convicted for selling peas injurious to the public health, he saw nothing to cause him to mitigate the fine, which, he believed, went up to £50. He did not want to be oppressive, but the heads of the chymical and analytical kingdom had said there was not only a traceable quantity of copper in the peas, but a dangerous quantity. Mr. Philbrick said the prosecution was instituted for the public benefit, and not with the view of punishment. The defendant said he did not sell three dozen tins in a year, and would discontinue the sale. Mr. Knox, after cautioning the defendant and expressing a wish that publicity might be given to the fact that persons would not be permitted to bring to this country goods deleterious to the health of the inhabitants, and that in future real and substantial fines would be inflicted, fined the defendant the nominal fine of 1s. and £5 5s. costs. Mr. Detmar having wished his case dealt with, he was similarly fined, and the other cases were adjourned.—*The Times.*

KICKING AN INSPECTOR.

William Neale, Chemist, of 21, George Street, Woolwich, was summoned for assaulting John Carty, inspector under the Adulteration Act. Mr. W. Farnfield prosecuted for the Woolwich Local Board of Health. Mr. Carty said he went into defendant's shop and asked a young man behind the counter if he sold castor oil lozenges? He replied that he did, and witness asked for a dozen, which were supplied at a charge of 9d. Witness then said that he had bought them for analysis, when the young man called the defendant, who tried to regain possession of the lozenges, saying that they did not contain castor oil, and that they were not the article required. Witness offered to divide them, so that defendant might retain a sample, but the defendant got very much excited and caught hold of witness's coat. He also raised a chair, and as witness was leaving the shop, kicked him. Defendant denied the assault, and his statement was confirmed by his assistant, who said that the lozenges, though called castor oil and other names, were simply aperient, and had no castor oil in them. It was stated that they were now being tested by the public Analyst. Mr. Balguy said he believed the inspector's statement, but the assault was not a serious one, and he fined defendant 5s. and costs.

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The Analyst,

INCLUDING THE PROCEEDINGS OF

THE "SOCIETY OF PUBLIC ANALYSTS."

A MONTHLY JOURNAL FOR THE INFORMATION OF THOSE INTERESTED IN THE PURITY OF FOOD AND DRUGS, AND IN GENERAL ANALYTICAL AND MICROSCOPICAL RESEARCH.

EDITED BY

G. W. WIGNER, F.C.S.,

ONE OF THE

Hon. Secretaries of the Society of Public Analysts;

AND

John
J. MUTER, Ph.D., F.C.S.,

ONE OF THE

Vice-Presidents of the Society of Public Analysts.

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1878.

THE ANALYST.

A REFERENCE to our title page will show that we have started on a new year of life under slightly varied conditions. While the proceedings of the Society of Public Analysts and the papers read before them, will as heretofore, furnish a large portion of our matter, and will, we trust, continue to give our subscribers the same valuable information they have hitherto done; a certain portion of our space will be devoted to noticing the progress of general research on subjects interesting to PRACTISING ANALYSTS as a body. We shall also devote a column to some short 'notes,' touching on any questions interesting to analysts generally, which may have occurred during the month, and it will be our strenuous desire to hold the scales of justice evenly, meting out praise where it is due, but fearlessly censuring when necessary. The utmost facilities will be given to correspondents to submit their views on any subject relating to food, drugs, or general analysis; we will willingly pay the usual honorarium for any useful contributions which we may insert from those, who, not being members of the Society of Public Analysts, have not the opportunity of reading their papers before the Society.

THE SOCIETY OF PUBLIC ANALYSTS.

An Ordinary Meeting was held at Burlington House, Piccadilly, on 14th March, 1877.

THE minutes of the last meeting were read and confirmed.

The President, Dr. Dupré, announced that the Council considered that as proprietors of The Analyst, the Society was not in a proper position, and they had therefore felt it necessary to make an alteration in reference to it. The Society would in future have no right whatever in *The Analyst* itself, or responsibility for it, but about 12 or 14 pages monthly would be under their control for publication of their proceedings, and the paper would be sent free every month to each member of the Society, in consideration of which, the Society would make an annual payment to the Proprietors of the Journal.

Mr. E. W. T. Jones read a paper "On Butter Fat, its Analysis and Composition."

Dr. Muter, Mr. Hehner, and Dr. Dupré, took part in the discussion which ensued, and Mr. Jones replied.

Dr. Muter read a note "On Copper in Preserved Vegetables," and a discussion ensued, in which Dr. Dupré and Mr. Piesse took part.

Mr. Wigner read a paper "On the Working of the Sale of Food and Drugs' Act," and a discussion afterwards took place on the subject.

ON COPPER IN FOOD.

BY A. DUPRÉ, Ph.D. F.R.S., &c.

Read before the Society of Public Analysts, at Burlington House, on 14th February, 1877.

AT the hearing of a case of alleged adulteration of green peas by copper, at Marlborough Street Police Court, a short time since, the evidence brought forward for the prosecution, on the one hand, and that advanced for the defence on the other, was extremely conflicting. The magistrate, in consequence, decided to reserve his judgment, stating that

he hoped in the meantime the merits of the case would receive careful discussion. I have, therefore, been induced to bring before you some experiments published by Dr. Odling and myself about nineteen years ago, bearing on this question. These experiments are, I believe, the most comprehensive and most careful yet made on the subject, but having appeared in a paper of but limited circulation, they are not very widely known.

The first question to be decided is, should the presence of copper in an article of food, green peas for instance, be looked upon as an adulteration or not? To answer this satisfactorily, it is clearly necessary in the first place to determine whether copper is or is not a normal constituent of the food in question. Now, there can be no doubt that minute traces of copper are present in almost all vegetable substances that have been examined. In the above mentioned paper, by Dr. Odling and myself, for example, we show that we found copper in 21 out of 22 samples of bread specially examined for copper, in every one of 20 samples of flour examined with the same object, and also in every one of 43 samples of wheat, barley, maize, wheat-straw, barley-straw, mangold wurtzel, swede, turnip root and leaf. In 25 out of these samples we estimated the copper quantitatively, the maximum amount found being 0·024 grains of oxide of copper in 100 grains of wheat ash, corresponding to about 1000 grains of fresh wheat, or 1 grain of copper oxide in 240,000 grains of wheat; the minimum being 0·004 grains in 100 grains of ash (turnip root), corresponding to 17,500 of fresh turnip, or 1 grain of copper oxide in 4,375,000 grains of turnip root.

These quantities are so small, that unless comparatively large quantities of material are taken, and the copper is specially searched for, it may readily be overlooked. A great variety of vegetable substances have also been examined by a number of chemists, with, speaking generally, the same result. If enough material is taken, the copper is almost always found, but in minute traces only. Since the passing of the Adulteration Acts, for example, a good many samples of preserved peas have been examined for copper by various public analysts, generally with negative results, proving that only minute traces of copper are normally present in green peas. One particular brand, however, always yields copper in notable quantities.

We may, therefore, conclude, without the least hesitation, that the copper naturally present is always a minute trace only, rarely amounting to so much as 1 grain in 200,000 grains of substance, and falling generally far short of that.

The first question—ought the presence of copper to be looked upon as an adulteration?—may therefore be answered thus: The presence of copper, in an article of food, when exceeding the proportion of say 1 grain in 100,000, must be looked upon as a decided adulteration, the said food not being of the nature, substance, and quality demanded.

The second question, viz.: what proportion of copper should be looked upon as an adulteration injurious to health? is much more difficult to answer, though we are not quite without facts to guide us even here.

Thus the medicinal doses of sulphate of copper, according to the Ph.B., are—

As an astringent	$\frac{1}{4}$ to 2 grains.
As an emetic	5 to 18 „

or, in their equivalent of copper—

As an astringent	$\frac{1}{16}$ to $\frac{1}{2}$ grain.
As an emetic	$1\frac{1}{4}$ to $2\frac{1}{2}$ „

Now as a rule, no drug or medicine can safely be taken, or in other words, taken without danger to health, unless it is done under the advice and guidance of a medical man. We may therefore fairly require, that in our ordinary articles we are not dosed unawares with medicinal quantities of a powerful drug. Seeing then that one-sixteenth of a grain of copper is already a medicinal dose, the quantity of that metal admissible in the amount of food taken at a meal should at least not exceed this.

Applying this to the case under consideration at Marlborough Street, we are, I think, justified in saying that 1-lb. of green peas should not contain more than from one-eighth to one-quarter of a grain of copper; anything beyond this should be looked upon as an adulteration, and punished as such.

In the paper above quoted Dr. Odling and myself have also given the result of the analyses of 29 samples of animal matters, in almost every one of which we detected the presence of copper. In 10 of these we estimated the amount of copper present, and found, for example, a proportion of copper, amounting to 0·035, and 0·029 grains of oxide of copper in human livers, or in each case about 1 grain of oxide of copper, in 500,000 grains of liver. Kidneys showed rather a higher proportion, or about 1 grain of oxide, in 100,000 parts.

In two sheep's livers bought with an interval of one year between them, we found, however, the extraordinary quantity of 0·513 and 0·590 grains of oxide or about 1 grain in 20,000 parts.

These proportions, which are much higher than those found in any vegetable food, seem to show that copper is, to some extent at least, a cumulative poison, and it becomes all the more imperative to exclude every trace of extraneous copper from all articles of food.

I had hoped to be able, in conclusion, to give the best method to be employed for the detection and estimation of these minute quantities of copper. My experiments are, however, not quite finished, and I must defer the description to some future time; here I will only remark, that the copper was precipitated on a platinum wire by a weak galvanic current, redissolved in nitric acid, and finally weighed as oxide of copper; a method which, since then, has been employed by various chemists.

In the discussion which ensued:

Mr. Dyer said that if the plea that copper was given in medicine was to justify its presence in every article of food, it might just as well be said, that because strychnia was used in medicine, we might not object if it was found in other things.

Mr. Wigner thought the question of injury to health ought not, under ordinary circumstances, to be raised, as in this prosecution; we ought to be content with the Act which directs a penalty of £20 for a conviction under Section 6, and he thought that that penalty was quite sufficient to act as a deterrent without going into the question of injury to health, leaving that to be brought out, not by the certificate, but only by the evidence. With regard to Dr. Dupré's paper, he thought that the maximum limit of copper, one-quarter of a grain in the pound was too high, and that we ought not to go beyond what Dr. Odling and Dr. Duprè have themselves found in vegetable products.

Dr. Muter said that as regards the estimation of copper, he thought that the platinum vessels that had been used were by no means free from reproach. He quoted one case of finding sulphate of copper in bread. A journeyman baker had introduced it as a new idea and two or three more bakers followed, and they afterwards confessed the

whole affair. At that time he found that when he incinerated in porcelain he got copper in his ash. He had lately investigated the amount of copper in Pharmaceutical extracts, and he found nearly all abounded in copper, and he had been obliged to form a standard of how much copper he ought to pass, and he had made the rule that if he did not get more than a milligram from 100 grains of extract he would pass them; if more, he condemned them.

Mr. Piesse said that as to the question of the peas being harmless, there was little evidence. Dr. Evans stated, at the hearing, there were very few cases of poisoning in this country, and he attributed that to the fact that our cooking utensils are made of iron, while in France copper ones are still used. The percentage table there, of accidental poisoning cases, shows over 20 per cent. to be due to poisoning by minute traces of copper, and he considered that owing to copper utensils being used.

Dr. Dupré, in replying, said that Dr. Odling and himself, in making their experiments used one platinum dish, which they afterwards cut up and examined, but found no copper in it.

NOTE ON COPPER IN VEGETABLES.

By J. Muter, Ph.D., F.C.S., &c.

Read before the Society of Public Analysts, at Burlington House, 14th March, 1877.

Having heard it stated by the agents for the manufacturers, as a plausible reason for using salts of copper in the manufacture of preserved peas, that the ingredients in question were used in all vegetables, being necessary for their preservation, I obtained a tin of "Macedoines" (mixed vegetables) and examined it. I took all the peas and beans together, then the carrots and turnips, then the water, and lastly the pulpy mixed vegetable matter, which could only be separated by filtration, and I obtained the following results:—

Peas and green vegetable contained	·100	copper
Carrots and turnips "	·010	"
Water "	·005	"
Mixed disintegrated matter "	·015	"
Total per tin ...	·130	"

It is therefore clear that the green vegetables alone are deliberately cooked in copper pans to give them colour, and that the use of copper for other vegetables is a fiction.

I may mention that I have also examined lately some tins of *champignons*, and also crystallized fruits, but found no copper in anything but some highly-coloured greengages.

ON PRUSSIC ACID FROM CASSAVA.

By E. Francis, F.C.S.

Government Laboratory, Trinidad.

It is well-known that two species of the tropical plant manioc or cassava are described; one of which is credited with powerful toxic properties, while the other, considered harmless, is cooked and freely eaten throughout the West Indies and South America. The two kinds are named by Tohl, *manihot utilissima*, and *manihot aipi* respectively, but they are commonly known as bitter and sweet cassava.

Observations respecting the poisonous action of bitter cassava upon men and animals have been frequently recorded, and the presence of prussic acid in the juice expressed

from the roots has long been established; although no attempts have apparently been made to determine the quantity of the poisonous acid yielded by the plant.

This point having formed the subject of inquiry, a number of determinations of prussic acid from bitter cassava were made; attention was then directed to the sweet kind, with the unexpected result of finding, that, not only did it yield prussic acid, but the quantity obtained from it often nearly equalled that from the bitter, and in no instance did it fail to furnish a certain amount of the poison.

The results of the examination for prussic acid of a number of samples of each kind of the plant are shown in the following table; the quantities being given in percentages, and also as grains of prussic acid from an avoirdupois pound of the fresh root.

TABLE I.

Quantity of Prussic Acid yielded by Cassava Roots.

SWEET.			BITTER.		
No. of Sample.	Per cent. of HCN.	Grains of HCN. per lb.	No. of Sample.	Per cent. of HCN.	Grains of HCN. per lb.
1	·0158	1·106	1	·0377	2·639
2	·0121	0·847	2	·0237	1·659
3	·0125	0·875	3	·0442	3·094
4	·0133	0·931	4	·0440	3·080
5	·0113	0·791	5	·0132	0·924
6	·0194	1·358	6	·0209	1·463
7	·0226	1·582	7	·0348	2·436
8	·0199	1·393	8	·0221	1·547
9	·0208	1·456	9	·0133	0·931
10	·0238	1·666	10	·0215	1·505
11	·0202	1·414			
12	·0134	0·938			
13	·0202	1·414			
14	·0149	1·043			
15	·0117	0·819			
Mean.	·0168	1·175	Mean.	·0275	1·927
Highest.	·0238	1·666	Highest.	·0442	3·094
Lowest.	·0113	0·791	Lowest.	·0132	0·924

The samples indicated in the table were obtained from as many sources as possible: some from stalls in the public markets, others direct from the different cultivators, pains been taken to avoid substitution of one kind for the other. The similarity of the plants renders such a mishap possible. Indeed, so close is the resemblance, that opinions are not wanting, expressive of belief that the one is merely a variety of the other, and not a distinct species.*

The mode of determining the prussic acid requires mention, special treatment being necessary, owing to the starchy nature of the roots. Distillation was requisite to obtain the prussic acid in a form adapted for estimation, but the thirty per cent. of starch, which the roots contain, had to be excluded from the retort. The following method of operating was adopted:—

500 grammes of the root were quickly grated into 500 c.c. of water. The mixture was allowed to stand in a well-closed vessel for about two hours, and the liquid was then

* See Pharm. Journal, 3rd series iii. 569; M. Paul Lagot, on the Manioc, or Tapioca Plant.

squeezed through a linen cloth into a flask. The flask being corked the starch was allowed to deposit, and then 200 c.c. of the upper portion of the liquid were decanted and distilled. The retort was connected by a caoutchouc joint to the condenser, the end of which dipped beneath the surface of water made alkaline with soda, and contained in a closed receiver.

The quantity of prussic acid found in the 200 c.c. of liquid represented one-fourth of that actually present. This estimate is arrived at in the following manner :—both bitter and sweet cassava were found by a number of determinations to contain close upon sixty per cent. of water. The 500 grammes of root taken, therefore, would furnish, approximately, 300 c.c. of water, which, augmented by the 500 c.c. added, would make an aggregate of about 800 c.c. All the prussic acid yielded by the sample, would, of course, be found in solution in this quantity of liquid. The amount present in the 200 c.c. removed, would thus represent $\frac{200}{800}$ or $\frac{1}{4}$ of the total quantity.

The prussic acid in the alkaline distillate was estimated either volumetrically or by precipitating and weighing as silver cyanide. The results were occasionally verified by combining the methods; first determining the prussic acid by volumetry, then adding excess of the silver solution to the same portion, acidifying with nitric acid, and collecting and weighing the silver cyanide produced. Fairly concordant results were thus obtained as shown by the following average examples.

I. Prussic acid from sweet cassava.

	Per cent. of HCN.	Grains of HCN. per lb.
Volumetric Method	·01992	1·3944
Gravimetric "	·01924	1·3468

II. Prussic acid from bitter cassava.

	Per cent. of HCN.	Grains of HCN. per lb.
Volumetric Method	·02090	1·4630
Gravimetric "	·01996	1·3972

The higher results furnished by volumetry, doubtless, showing the usual error arising from the slight excess of standard solution required to indicate the completion of the process. The silver solution used was nominally decinormal, but, its exact strength was fixed with care.

During the grating of the cassava, which occupied about five minutes, a slight loss of prussic acid was made evident by its odour. Nevertheless, this was certainly too small to seriously affect the correctness of the determinations, since the quantity of prussic acid found in the normal juice, seldom exceeds one part in two thousand of liquid, and such dilute solutions bear moderate exposure without being sensibly altered. Estimations made at intervals of the prussic acid in the diluted juice, showed that, standing in a loosely-covered beaker, it suffered no apparent loss during two hours; but a loss of about one-tenth was found after sixteen hours. When fermentation was in progress, the prussic acid soon diminished, and in six days became reduced to one-fifth of the original quantity.

The juice, although at first nearly neutral, quickly became acid, and was always so at the time of distillation. In some of the earlier experiments, sulphuric acid was added to the contents of the retort, usually after all the free prussic acid had passed over, but the yield was not found to be influenced by this treatment.

The high temperature prevailing in this climate rendered it necessary to prove that prussic acid could be isolated by distillation from dilute solutions without loss. Aqueous

prussic acid, therefore, was prepared, and diluted until 20 c.c. made up to 200 c.c. with water would furnish a solution containing about twice the quantity found in the liquid strained from the roots. Two such mixtures having been made, the prussic acid in one was estimated directly, and in the other after distillation. The following results were obtained :—

	HCN. in 200 c.c. of solution.
1 Not distilled	·06824 grm.
2 Distilled	·06744 „

Corrected temperature of water passing from condenser 25·2° c; of laboratory 27° c; this temperature being usual.

A second trial was made by diluting 20 c.c. of the same aqueous prussic acid to 500 c.c. Two portions of 200 c.c. were measured, and the prussic acid in each estimated as before.

	HCN. in 200 c.c. of solution.
1 Not distilled	·02734 grm.
2 Distilled	.02726 „

A final experiment determined whether a known quantity of prussic acid added to the *diluted juice* suffered loss by distillation. The juice used had not been distilled, or deprived of the prussic acid naturally present, but this was estimated by a separate experiment and allowed for. The usual quantity was taken, and 100 c.c. of prussic acid, which had been found to contain ·02599 grammes of H C.N. were added. The mixture was distilled.

Total HCN. by distillation	·03447 grm.
HCN. natural to juice	·00951 „
HCN. recovered	·02496 grm.

TABLE II.

Percentage of Water found in Cassava Roots.

SWEET.		BITTER.	
No. of Sample.	Per cent. of H_2O.	No. of Sample.	Per cent. of H_2O.
1	58·73	1	59·40
2	58·33	2	60·80
3	59·13	3	61·80
4	61·31	4	61·24
5	58·25	5	62·07
6	60·65	6	62·79
Mean.	59·40	Mean.	61·35

PRESENCE OF CINCHONIDINE IN THE QUININE SULPHATE OF COMMERCE.

By B. H. Paul, Ph.D.

Pharmaceutical Journal [3]. *No.* 347, *p.* 672.

The samples were dried at 212° F, and weighed in a weighing glass, perfectly closed, so that no moisture could be absorbed. The cinchonidine was separated by dissolving four or five grams of the salt in 80 to 100 c.c. of boiling water, and, after cooling, filtering the liquid, and then shaking it with sufficient ether to leave a distinct layer undissolved. On

the addition of ammonia solution in excess, the alkaloid separated was in most instances only partially soluble in the ether; with the samples containing least cinchonidine, the whole of the alkaloid was at first dissolved by the ether; but after the lapse of a few hours, the cinchonidine was deposited in the form of crystals, which were collected on a filter and weighed.

The quinine sulphate separated on cooling the hot solution, was again re-crystallized in the same way as at first, and the mother liquor was treated as before with ether and ammonia. In this way a further quantity of alkaloid, insoluble in a moderate quantity of ether, was obtained, and by repeating the re-crystallisation of the salt a third time, another smaller quantity was obtained. The mother liquor obtained by a fourth re-crystallisation gave no evidence of cinchonidine, so far as treatment with ether was capable of indicating its presence. The first six samples were taken from sealed ounce bottles, of which only No. 3 had been previously opened. In all these instances the amount of crystallisation water was not much different from that normally appertaining to the salt, viz., : 14·45 per cent.

The smaller amounts of water in the samples Nos. 7, 8, and 9, were, probably, due to some degree of efflorescence, since these samples had been for some time exposed to the air; so that, making allowance for the circumstance, the proportions of cinchonidine sulphate in the original salt would be somewhat less than those stated as the result of analysis. Apart from the loss attending the operation, the amounts of cinchonidine sulphate indicated by these results are to be regarded in all cases as minimum amounts, inasmuch as some cinchonidine still escapes separation by ether.

No.	Water, per cent.	Dry Cinchonidine Sulphate, per cent.		Crystallised Salt, per cent.
(1)	16·05	7·98	equal to	9·19
(2)	15·51	7·51	„	8·64
(3)	14·90	4·22	„	4·86
(4)	15·04	5·92	„	6·81
(5)	14·20	·99	„	1·14
(6)	15·15	3·16	„	3·64
(7)	13·67	4·90	„	5·64
(8)	8·10	4·55	„	5·24
(9)	10·37	5·44	„	6·26

A. W. B.

We reproduce the following letter from *The Grocer* of March 24th, in the hope that the trade generally will follow the excellent example of the writer.

SIR,—I think I may presume that upon the clearest medical testimony it has been proved that preserved bright green peas contain a proportion of metallic copper, and therefore are, and should be, unsaleable. And yet in the face of this fact, and after several convictions, these bright green peas are being sold to the public. My pet brand I have had analysed by one of the first in the profession, and the report before me is (per tin) ·42 metallic copper, equal to 1·65 grains of sulphate of copper;—the sale of which I have stopped. Now, the question I wish to raise is—Is it wise on the part of the trade to continue to sell an article known to be injurious to health? There can be no excuse for such, from the fact that Messrs. Crosse and Blackwell's Circular, dated March 1st, states:—"Preserved Green Peas.—We beg to remind our friends that the peas and other vegetables prepared by ourselves and Messrs. Philippe and Canaud have always been perfectly pure and uncoloured." These peas are certainly not of so bright a green colour, but in my humble opinion are in size and flavour all that can be desired. My own feeling is, that the sale of the bright peas should at once be stopped; and I say without hesitation that it is a disgrace to the trade to have it said that such peas can be purchased by the public, after the clear medical evidence given.

I am, &c.,

Clapham, *March 21st.* E. J. WRIGHT.

RETURNS OF ANALYSES MADE UNDER THE SALE OF FOOD AND DRUGS' ACT IN 103 DISTRICTS DURING 1875 & 1876.

We have great pleasure in presenting the following Returns to our readers, and in expressing our obligation to those gentlemen who have, at considerable trouble to themselves, enabled us to make them so complete. We feel that special acknowledgment is due to some gentlemen, who, not being members of the Society, have nevertherless favoured us with their reports.

As regards the number of Convictions the table is necessarily incomplete. Analysts, as a rule, know very little if anything of the prosecutions, and it is better that they should not.

The results were laid before the Meeting of the Society on the 14th inst, and considerable interest was taken in them.

		Total.	Adulterated.	Convictions.	Milk.	Groceries.	Drugs.	Spirits, &c.	Bread & Flour.	Sundries.
M. A. Adams ...	Kent.	8	0	—	—	—	—	—	—	—
(Samples collected by Police.)										
A. H. Allen ...	North Derbyshire.	118	23	17	3	7	5	8	—	—
	Sheffield.	256	38	6	15	14	7	—	2	—
A. Angell ...	Southampton.	480	96	—	—	—	—	—	—	96
(Samples collected by Police.)										
R. Apjohn	Cambridge (Borough).	18	13	—	13	—	—	—	—	—
	Cambridge (County).	0	0	—	—	—	—	—	—	—
	Ely (Isle of).	14	4	—	—	—	—	4	—	—
	Huntingdon (County).	1	0	—	—	—	—	—	—	—
W. Baker	Rotherham.	31	8	—	—	—	—	—	—	—
	Upper Strafforth and Tickhill.	13	4	—	—	—	—	—	—	—
J. J. Bancroft	Denbighshire.	0	0	—	—	—	—	—	—	—
(Act suspended)										
J. C. Bell	Salford and Cheshire	182	85	30	40	5	10	6	22	2
W. Bettel	Middlesborough	41	4	4	4	—	—	—	—	—
T. B. Blunt ...	Shrewsbury. Shropshire, and Montgomeryshire.	18	5	2	3	—	—	—	1	1
J. Brierly	Southampton.	206	72	21	42	17	5	—	8	—
J. C. Brown ...	Lancaster (County).	412	102	—	85	11	—	5	1	—
	Liverpool.	222	73	41	63	7	2	1	—	—
	Preston, *(Act not enforced till* 1877.*)*	0	0	0	—	—	—	—	—	—
C. A. Cameron...	Carlow.	1	1	—	—	1	—	—	—	—
	Cavan.	5	2	1	2	—	—	—	—	—
	Clare.	130	18	3	7	—	1	4	—	6
	Down.	1	1	1	1	—	—	—	—	—
	Drogheda.	20	7	7	7	—	—	—	—	—
	Dublin (City).	1576	205	112	162	41	—	2	—	—
	Dublin (County).	268	65	46	57	8	—	—	—	—
	Fermanagh	26	12	9	8	4	—	—	—	—
	Galway	40	16	10	14	—	—	2	—	—
	Kerry	18	6	2	3	3	—	—	—	—
	Kildare	68	20	12	19	1	—	—	—	—
	Kilkenny	17	10	—	8	—	—	2	—	—
	Limerick	43	13	—	11	—	2	—	—	—
	Leitrim	1	1	—	1	—	—	—	—	—
	Mayo	15	9	4	8	—	1	—	—	—
	Meath	—	—	—	—	—	—	—	—	—
	Queens	10	3	3	3	—	—	—	—	—
	Roscommon	40	10	4	6	1	—	3	—	—
	Sligo	11	5	5	5	—	—	—	—	—
	Tipperary	26	15	8	14	1	—	—	—	—
	Waterford	3	0	—	—	—	—	—	—	—
	Wexford	—	—	—	—	—	—	—	—	—
	Westmeath	—	—	—	—	—	—	—	—	—
	Wicklow	7	6	2	5	—	1	—	—	—

		Total.	Adulterated.	Convictions.	Milk.	Groceries.	Drugs.	Spirits, &c.	Bread & Flour.	Sundries.
J. Clark	Paisley.	14	4	—	2	2	—	—	—	—
	Dumbarton.	22	8	—	8	—	—	—	—	—
E. L. Cleaver...	Kensington.	458	48	46	28	10	—	—	—	10
J. H. Collins ...	Cornwall.	—	—	—	—	—	—	—	—	—
W. H. Corfield	St. George's, Hanover Sq.	168	20	2	14	6	—	—	—	—
M. Corner	Mile End Old Town.	72	1	—	—	1	—	—	—	—
A. Dupre'.........	Westminster.	133	13	—	8	5	—	—	—	—
A. M. Edger ...	Durham.	167	48	—	40	8	—	—	—	—
	Gateshead.	138	21	15	12	6	3	—	—	—
C. Estcourt ...	Manchester.	113	50	27	11	19	—	2	18	—
H. Goode	Derbyshire.	66	15	—	4	5	—	6	—	—
J. H. Gramshaw	Gravesend.	—	—	—	—	—	—	—	—	—
Hassall & Hehner,	Isle of Wight.	106	24	—	1	17	—	6	—	—
C. Heisch	Hampstead.	59	1	—	—	—	—	—	1	—
	Lewisham.	89	11	3	7	4	—	—	—	—
A. Hill	Birmingham.	164	60	8	21	27	10	2	—	—
J. F. Hodges ...	Belfast.	252	90	—	—	—	—	—	—	90
J. Horsley	Gloucester County.	605	37	33	7	27	—	—	—	3
	Ditto City.	73	16	16	4	10	—	—	—	2
G. Jarmain ...	Huddersfield.	82	22	11	10	12	—	—	—	—
H. Johnson ...	Shrewsbury.	3	1	—	—	—	—	1	—	—
E. W. T. Jones	South Staffordshire.	712	125	—	46	49	7	21	2	—
	Wolverhampton.	173	15	—	10	2	1	2	—	—
J. R. Leebody...	Londonderry City & County.	105	10	—	—	1	—	1	—	8
R. McAlley	Falkirk.	—	—	—	—	—	—	—	—	—
	Stirling.	—	—	—	—	—	—	—	—	—
McCowan & Biggart,	Greenock.	154	25	—	15	2	1	7	—	—
J. M. Milne......	Dumferline.	14	1	—	—	—	—	1	—	—
	Kinning.	62	27	—	27	—	—	—	—	—
	Govan (Parish).	60	26	—	26	—	—	—	—	—
E. H. Moore ...	Brighton, and East Sussex.	241	23	9	13	8	—	1	—	1
W. Morgan ...	Swansea	315	69	44	52	5	—	7	5	—
J. Muter ...	Bermondsey	447	57	—	28	29	—	—	—	—
	Lambeth	456	34	—	24	8	—	1	1	—
	Rotherhithe	119	15	—	9	5	—	1	—	—
	St. George's, Southwark.	27	9	—	2	7	—	—	—	—
	Wandsworth	1014	45	—	14	27	1	3	—	—
C. O'Keeffe ...	Cork City.	106	26	21	24	1	—	1	—	—
	Cork County.	56	5	—	—	4	—	—	1	—
J Pattinson	South Shields	13	11	9	11	—	—	—	—	—
	Newcastle	199	43	12	22	20	—	—	1	—
F. T. Paxton	West Sussex.	6	1	—	—	1	—	—	—	—
W. Procter ...	Beverley.	—	—	—	—	—	—	—	—	—
F. M. Rimmington	Bradford	247	26	—	23	1	—	—	—	2
E. Sergeant ...	Bolton.	49	16	8	10	4	—	—	2	—
J. Shea............	Reading.	86	2	—	2	—	—	—	—	—
A. W. Smith ...	Rye.	—	—	—	—	—	—	—	—	—
T. Stevenson ...	Bedfordshire.	319	37	—	5	20	—	2	10	—
	St. Pancras.	237	60	—	31	10	3	15	—	—
	Surrey.	694	64	—	30	33	—	—	1	—
W. W. Stoddart	Bristol and Somerset.	1572	398	—	95	276	—	26	1	—
R. R. Tatlock	Govan Borough.	30	11	—	10	1	—	—	—	—
J. W. Thomas	Cardiff.	230	27	—	8	12	—	3	—	4
J. W. Tripe ...	Hackney.	214	9	9	8	1	—	—	—	—
Wallace, Tatlock & Clark	Glasgow.	250	133	—	98	13	3	8	—	11
Wm. Wallace...	Ayr.	9	4	—	2	—	—	2	—	—
	Kilmarnock.	10	5	3	5	—	—	—	—	—
	Rutherglen.	8	1	—	1	—	—	—	—	—
J. Wiggen	Ipswich. Colchester, and East Suffolk.	1	1	—	—	1	—	—	—	—
G. W. Wigner	Greenwich and Deptford.	275	42	—	19	9	1	12	1	—
	Plumstead.	213	19	—	12	6	—	—	1	—
	Woolwich.	136	31	—	15	6	2	7	1	—
	Total ...	15,989	2895	626	1483	833	66	175	80	—

THE WORKING OF THE SALE OF FOOD AND DRUGS ACT, DURING 1875 & 1876,

By G. W. Wigner, F.C.S.,

Read before the Society of Public Analysts, at Burlington House, Piccadilly, on the 14th March, 1877.

I have much pleasure in laying before the Society this evening a large number of returns, which have been most courteously communicated by the Members of this Society, and by some Public Analysts who do not yet belong to us, showing the degree of success or otherwise which has attended the working of the present Anti-Adulteration Act.

The returns possess many features of great interest, but the most important point is the percentage of all the samples which were found to be adulterated. During the well-known investigations of the Lancet Commission, Dr. Hassall and others found that about 65 per cent. of the samples purchased were adulterated. Under the Act of 1860, the amount of work done was so small that it would be worthless as a comparison. The Act of 1872 made a change, although it was not universally enforced; yet in the course of some sixteen months nearly 15,000 samples of food were analysed, and even then the striking result was shown that 26 per cent. of the whole number were adulterated. These samples, it must be remembered, were not purchased by private consumers, but in nearly every case by a public official, who was well known and therefore presumably well served.

The returns I hold in my hand show the first results of the Act of 1875, which it must be borne in mind is still simply a permissive, and not a compulsory Act, and, at the first glance, the result is gratifying, for we find that while in 103 districts 15,989 samples have been analysed, only 2,895 have been found to be adulterated, or 18·10 per cent. of the total number, thus showing an improvement of 8 per cent. in two years. The improvement thus shown is probably below rather than above the truth, since the processes in use for analysis have been perfected, and many samples which would have been passed as pure two years since, would now be condemned.

There are, however, some very unsatisfactory features to set against this, for instance the number of samples of adulterated milk has actually increased from 1066 to 1483, in other words from 28·24 per cent. to 51·22 per cent. of the total number of adulterated samples. This would certainly indicate that the milk trade has not thus far been rendered moral by Act of Parliament.

It has not been possible to procure the exact list of samples purchased in each case, but in nearly all the Districts the analysts have kindly furnished the names of the adulterated articles, and calculating these on the *total* number of samples purchased, we find that:—

9·28	per cent.	were Adulterated	Milk.
5·27	"	"	Groceries.
·41	"	"	Drugs.
1·09	"	"	Beer, Wine and Spirits.
·50	"	"	Flour and Bread.
1·55	"	"	Sundries.
18·10	"	Total.	

During the previous period the adulterated milks were only 7·31 per cent. of the total samples.

On viewing the matter in another light, we find that the adulterated samples alone may be divided as follows:—

Milk	51·22	per cent.
Groceries	29·15	,,
Drugs	2·27	,,
Beer, Wine and Spirits	6·04	,,
Flour and Bread	2·76	,,
Sundries	8·56	,,
	100·00	

What with watering and skimming therefore, milkmen are responsible for more than half the adulteration which at present goes on; grocers for nearly three-tenths, and even chemists and druggists, though their goods are but comparatively seldom examined (in fact not one-tenth as often as they ought to be) figure nearly as high as the bakers, who expect a periodical visit from an inspector. This state of things is not as it should be.*

From the general view of the subject we pass to the specific, and here the permissive and, consequently, uncertain character of the Act is well exemplified.

Thus, although competent analysts have been appointed for Cambridgeshire, Denbighshire, Meath, Wexford, Westmeath, Cornwall, Gravesend, Falkirk, Stirling, Beverley, and Rye, not a single sample has been submitted for analysis in any of the eleven districts. While in the Counties of Kent, Huntingdon, Shrewsbury, Shropshire, Montgomeryshire, Down, Leitrim, Waterford, Wicklow, West Sussex and East Suffolk including the towns of Ipswich and Colchester, eleven counties in all, only forty-six samples have been analysed, or a fraction more than four per county. It is not to be wondered at that one third of these samples were adulterated, or that all the four samples submitted from Carlow, Down, Leitrim, and East Suffolk were so. It is not in human nature to avoid selling impure things where the vendors know they will escape, but it certainly appears to me a clear indication of the necessity of altering the Act so as to make some provision for such cases as these.

A careful examination of these returns points out clearly another defective feature in the Act. In the County of Kent only eight samples were taken, but all were pure. The reason is not far to seek, for we find they were all purchased by *policemen in uniform*. In Mile End Old Town, where it is not generally considered we should find the purest articles, only one sample out of 72 was adulterated, at Hampstead, one out of 59, and at Hackney, nine out of 214; in each case the inspectors who purchased the samples were *well known local men*. The remedy is obvious.

Scotland presents an unfavourable figure in the returns, only 633 samples have been examined, but 248 or more than 39 per cent were adulterated.

London (although our returns here are even now incomplete) counts for more than 25 per cent. of the total number of samples, and the percentage of adulteration actually shown is only 10·08 per cent. of the samples of which 219 or 5·32 per cent. are milk.

It is singular that such towns as Salford and Glasgow, although both fortunate in securing the services of competent men as analysts, stand worst in the returns, the former showing 46·70 per cent. adulterated, of which 21·98 per cent. were milk, and the latter 53·20 per cent. of which 39·20 per cent. were milk.

* In reference to the author's remark, we draw attention to a letter from Dr. Dupré appearing in this number.—Editors' Analyst.

From all these figures the inference that the Act needs amendment is clear. It is radically wrong that nearly a third of the counties should be entirely or practically exempted from the action of a salutary Act such as this is.

We also see clearly the evil effect of well known men purchasing samples.

I think two more inferences may fairly be drawn.

1st. The trivial fines generally imposed in milk cases are quite insufficient to prevent adulteration. It is more profitable to dilute and pay the fines, laying the blame on to the man who takes the milk out, than to carry on business honestly.

2nd. Drugs need much more attention than has hitherto been given to them. Of all articles they should be the most pure, yet, I believe, that if I could, in each district, find the number of drugs purchased for examination, the resulting per centage found impure would be startling.

I hope to bring the matter before the Society again at our next meeting, with a view of our making some representation to the Government on the matter.

ON THE ESTIMATION OF ALUM IN BREAD.

By W. C. Young, F.C.S.

For a long time past the old "Normandy" or "Soda" process for the estimation of alum in bread, has been condemned on account of the great difficulty experienced in redissolving the aluminic hydrate or phosphate, after its precipitation together with tri-calcic phosphate, &c. This has led to the production of several processes, most of which are very complicated. By a slight modification in the usual method of procedure, the "Normandy" method can be rendered as accurate in its results as any of those which have replaced it. This consists in adding the boiling acid solution of the charred bread to a boiling solution of sodic hydrate, containing a large excess. I proceed as follows:—1,000 grains of bread are burnt down to a small bulk, powdered with about 100 grain measures of hydric chloride, and warmed for a few minutes; about two ounces of water is then added, boiled for five minutes, and filtered, &c. A solution containing about 250 grains of pure sodic hydrate is made in a very little water, and to this solution, when boiling, is very cautiously added the boiling acid solution of the charred bread, the whole boiled for a few minutes, filtered and washed. The filtrate, after the addition of a few drops of a concentrated solution of disodic phosphate, is slightly acidified with hydric chloride, and subsequently rendered just alkaline with ammonic hydrate and boiled. The precipitate is collected, washed, and weighed as aluminic phosphate.

To test the accuracy of this method, I had four loaves of bread made in my kitchen, one with no alum, the others with varying quantities. Care was taken to leave as little as possible of the dough adhering to the sides of the vessel in which it was made, so that each loaf contained, practically, all the alum that was dissolved in the water with which it was made. The loaves were weighed when one day old, and 1000 grains taken of each.

	Weight of Loaf.	Grains of Alum put in.	Weight of Al. PO4 from 1000 grains.	= grains of Alum in loaf.
1	2 lbs.	0	·07 grains	3·60
2	1½ "	10	·32 "	12·39
3	2 "	20	·46 "	23·80
4	2¼ "	40	·76 "	44·20

It will be seen the method leaves nothing to be desired in point of accuracy, and will favorably compare with any other in respect to simplicity.*

*Since devising the above process, I have been informed by Mr. Heisch, that he, and he thinks others, have for many years applied the same principle (viz., the addition of the acid solution to an excess of boiling alkali), to the separation of aluminic hydrate from other gelatinous precipitates, having found it impossible completely to re-dissolve the aluminic hydrate by any amount of sodic hydrate if it were once precipitated.

CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

To the Editor of "The Analyst."

THE "ORGANIZATION AMONGST CHEMISTS."

Sir,—Will you grant me a line of your space to ask if it be really true, as I have heard, that by the scheme, as at present proposed, all chemists now in business are not to be admitted, as a matter of course, into the new organization, but that the sapient few who have nominated themselves as judges are to select whom they please to be dubbed "competent." Perhaps some of the leaders of our profession, as they call themselves, will satisfy the curiosity on this point, which is shared by many Analysts throughout England, and by none more so than by

One who has been in Practice for Twenty Years.

To the Editor of "The Analyst."

Sir.—In order not to allow the important question raised by the letter of Dr. Lowe in the January number of *The Analyst* to drop, without some further discussion, I beg to forward the following account of my experience regarding the purity and strength of the drugs and medicines dispensed in London.

I have, during the last five years, carefully examined 165 samples of drugs and medicines bought at the better class of chemists' shops in all parts of London. With very few exceptions, all these drugs were bought under the Latin name, by which they are distinguished in the British Pharmacopœa (1867) or more directly still as representing the pharmacopœa standard. In many cases the bottles or packets were labelled B.P. or Brit. Pharm.; in some the label stated contains so and so much of such and such as the case might be.

If, under these conditions, the strength of the drug or medicine bought falls considerably below the standard of the Pharmacopœa, I consider the article adulterated, entirely irrespective of the intrinsic harmlessness or otherwise of the substance used for adulterating. The value of a drug or medicine depends in great measure on its really being of the strength it is supposed to be, and any material departure from such a standard is highly injurious.

Well, out of the 165 samples examined no less than seventy-one were found adulterated, some to a very considerable extent. I will give a few examples.

Liquor Arsenicalis.

Should contain four grains of arsenious anhydride per fluid ounce. Six samples were examined, containing the following proportions of arsenious acid; per ounce, 2·5, 3·2, 3·7, 3·75, 3·8, and 3·9. The first of these proportions presents an adulteration equal to a dilution of 60 per cent., or 100 ounces of true liquor arsenicalis had been made into 160 ounces.

Scammony.

According to the Brit. Pharm. this should contain 80 or 90 per cent. resin soluble in ether, and should be free from carbonates and starch. Fluckiger and Hanbury give 88 to 90 and state that scammony which does not afford at least 80 per cent. of matter soluble in either, should be rejected. Six samples examined, etherial extract in five ranged between 65·2 and 70·3, in one just comes up to 80 per cent. All samples contain chalk, some more than ten per cent.; three contain starch in addition.

Ferri et Quiniæ Citras.

Should contain 16 per cent. of quinine, 20 per cent. of ferric oxide. Seventeen samples examined, six came up to standard, in eleven the alkaloid, not always pure quinine, ranged between 4·1 and 10·3 per cent., the ferric oxide from 19 3 to 33 per cent. I will give the short remarks in my laboratory book with regard to two, at least, of these samples. No. 19 labelled "contains 25 per cent. of citrate of quinine" (which would be correct) contains 4·69 per cent. of quinine, and 2·35 per cent. cinchonine; tartaric acid too much ferric oxide (24·1 per cent.) 10 per cent. carbonate of potassium in ash. Very bad sample.

No. 20 labelled "contains 25 per cent. of citrate of quinine" contains 4·46 per cent. of quinine, and 0·5 per cent. of cinchonine, much tartaric acid, too much ferric oxide (22·6 per cent.) 6·9 per cent. carbonate of potassium in ash. Very bad sample.

But it is useless to multiply examples. My experience may be summed up as follows. Drugs consisting of sugar, well defined chemical compounds, such as bromide of potassium, iodide of potassium, *sulphate of quinine. &c., &c.,* are nearly always found pure. All such, on the other hand, as should

contain a certain proportion of active ingredients, or should be the more or less altered natural product, are frequently adulterated. Thus out of forty-nine samples of the first class, two only were found adulterated, whereas out of 116 samples of the second class no less than 69 were found adulterated.

As Analyst for Westminster, I have examined 359 articles of food and drinks, viz., 135 samples of milk, and 224 samples of bread, tea, coffee, sugar, mustard, butter, ale, porter, gin, port wine, vinegar, pepper, jam, oatmeal, arrowroot. Out of 135 samples of milk, 40 were found adulterated with water, and 8 more had been skimmed, total 48, or a little more than one-third. It is right, however, to state that at first the proportion of samples found adulterated, was considerably higher, while at present, it is considerably lower. Of the remaining 224 samples, 14 only were found adulterated, and in two more adulteration was suspected, but could not be proved; thus of the drugs, 43 per cent. were more or less adulterated, and of other articles, only a little more than 17 per cent. Comment, I think, is needless.

I remain, &c.,
A. DUPRÉ.

Westminster Hospital,
March 19*th*, 1877.

The following correspondence between the Public Analyst for Gravesend and the Local Government Board is of such general interest, that we reprint it for the benefit of our readers.

To the Members of the Local Government Board.

January 23*rd*, 1877.

Gentlemen,—On reporting the fulfilment of my duties as Analyst during the past quarter, I find I have had to analyse water three times, and to report on the examination of meat once; this is all.

It is not to be supposed that articles of food sold in the town are all free from adulteration, such, I know, is not the case. It appears to be the duty of no one to bring them for examination, therefore they are not examined. I gather also that my duty does not extend to searching for adulteration, but that I am only to examine what is brought to me by the Inspector, an official complaint having been made.

Milk is almost universally sold mixed with 25 per cent. of water, and confessedly so.

A large quantity of butter called "Irish," is also sold at 1s. a pound, and I could, I believe, find other articles of the same impure character.

May I then ask for information on the following points?

1. Have I the power in my own hands of directing the Inspector to procure specimens of articles I suspect to be adulterated, and to bring them to me for examination?
2. Is it my duty to do this?
3. Have I the power to direct him to procure me water from wells which are complained of, or must I wait for the order of the Water Sanitary Authority, whose officer I am supposed to be, and who pays the whole of my salary?

I believe many wholesale dealers know well in what towns analysis is frequent, and act in their sales accordingly.

I am, yours truly,
J. H. GRAMSHAW, M.D.,
Analyst for Gravesend.

Local Government Board,
February 6*th*, 1877.

Sir,—I am directed by the Local Government Board to acknowledge the receipt of your letter, dated 23rd ultimo, with reference to your powers and duties as Public Analyst for the Borough of Gravesend, and in reply, I am to refer you to section 13 of the "Sale of Food and Drugs' Act," 1875, which provides for procuring samples for analysis "under the direction of the Local Authority," and to point out that it is by the Authority, and not by the Analyst, that the direction to procure samples must be given to the Inspector or other officer.

I am, Sir,
Your obedient Servant,
W. ROBSON,
Assistant-Secretary.

NOTES OF THE MONTH.

The report of the Inland Revenue Laboratory, just issued, was the subject of some comments by our President at the last meeting. While not wishing to detract one iota from the merit of gentlemen, who seem to have been sedulously educating themselves for the novel duties thrust upon them, we cannot help thinking that their remarks as to the milk standards adopted by our Society are uncalled for. Are they to set up their hundreds of samples against the collected thousands of the Members of our Society? If so they should in fairness publish their standard, so that we might either work by it or criticise it in a fair spirit. Then, as regards the butter and whiskey cases—in the latter the Society agreed with the Inland Revenue Chemists, and acted upon their conviction in such a decided manner as to cause the removal from their body of the person implicated. On the other hand, in the butter case, there were on one side our present President, one of the Vice-Presidents, and the Secretary, unanimously pronouncing the sample to be "butterine," and for the defence the Inland Revenue Chemists standing alone. Some degree of self congratulation is taken in the report that magistrates have invariably adopted the Somerset House view of questions in dispute; but in the butter case, those who were in court will remember that Mr. Partridge (the stipendiary magistrate,) specially said *that he felt himself bound by the Act to accept their* DICTUM. So long as the Inland Revenue Chemists pursue the even tenor of their way and continue to strive after the best processes they will have assistance from all, but let them keep out of their reports anything approaching to self adulation. Their will has become law, and let them be thankful for that, and not stoop from the high position in which the legislature has placed them. Above all, when they adopt a standard different from ours, we call on them in all justice to communicate it officially to our Society so as to avoid discrepancies, which are always painful to us, as being bound to be the losing party, and which must also be annoying to them, as gentlemen feeling for their fellow workers in science. Personally, we much respect Mr. Bell and his coadjutors, and we trust they will take our remarks in all friendliness, as an exposition of the matter from the point of view necessarily held by our Society.

The scheme for organization amongst chemists is now considered, by its promoters, to be on the fair road to success, inasmuch as the committee appointed by the select nucleus has furnished a definite scheme which has been adopted. If what has, according to our correspondent, (whose letter we print), leaked out in the profession is true, the real working analysts, into whose hands the commercial analyses of the country are now intrusted, will, nevertheless, look upon the scheme with considerable caution before recognizing it. A movement of this kind to be successful, and even honest, must not interfere with existing interests. Would Parliament, for example, ever have passed the Pharmacy Act, unless it had contained the clause providing for the registration of all men actually in business for themselves, within a certain time of the passing of the measure? Yet we hear that there is no such provision in the scheme, but that the new authority is to *choose* whom it shall admit! Suppose in some country town A happens to have obtained a place in the nucleus, is it in human nature to suppose that he will not try his utmost to prevent the election of B, whose practice far outsteps his own, so

that he has no time to look after the organization business, and has, therefore, not been asked to join. Representing, as we do, the real backbone and sinew of the analytical profession, we invite those who are desirous of doing so to make use of our columns for the expression of their views on a subject so vitally important to all analytical chemists throughout Great Britain.

We observe with sorrow the results of some cases of drug adulteration, which have been used by the trade journals as another opportunity to denounce analysts. We would earnestly recommend all Public Analysts, before they give adverse reports respecting a substance of which they have not had much experience, to consult some other member of the Society, who has made a *speciality* of the article. On this point our respected President made some very cogent remarks at the last meeting, which ended in the following excellent proposal. His idea was that each member should state to the Secretaries his willingness to always examine for any Public Analyst, free of charge, any article on which he had written or had made special researches, and in reference to which the Public Analyst proposed to return a certificate of adulteration; the conditions being that the Analyst and the Referee should both send in their results to the Secretaries for publication in this journal. In this way the best analytical skill in our particular branch of chemistry would be brought to bear on anything novel, and if the case should be defended, confirmatory evidence would be available. We shall be glad to receive communications on this subject from any gentlemen willing to co-operate in our President's generous scheme.

Surely there must be some mistake in a report which we reprint in another place, from the *Standard* newspaper, of the proceedings at Brighton in a Milk case. No analyst in his senses would ever be guilty of such a statement as the one *attributed* to our Brighton *confrere*, viz.: that serving milk from a dish, without stirring, would cause the under portion to show 25 per cent. depreciation (*i.e.* water). We invite the gentleman affected by the report to explain what he really said, and meantime we reserve our remarks till we have his statement.

BOOKS, &c., RECEIVED.

The Miller; The American Chemist; The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Telegraphic Review; The Medical Record; The Geological Society's Proceedings; The Anti-Adulteration Review; Health; The 15th Report of the Medical Officer of Health for Dublin; The Report of the Principal of the Somerset House Laboratory; Adulteration Returns for Norfolk and Yarmouth, by F. Sutton; Dr. F. V. Hyden, on the Use of Salycilic Acid.

We are compelled through want of space to omit for the present the following papers:—

The Qualifications of Public Analysts.

Butter Fat, its Analysis and Composition, by E. W. T. Jones, F.C.S.

Alum in Flour, by J. Carter Bell, F.C.S.

Copper in Peas, by C. H. Piesse, F.C.S.

RECENT CHEMICAL PATENTS.

The following specifications have been published during the current month, and can be obtained from the Great Seal Office, Southampton Row, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
2016	H. E. Newton	Removing extraneous Vegetable Matters fr. Fabrics	6d.
2524	A. M. Clark	Evaporating and Incinerating	1s.
2564	J. Muirhead, Jun.	Electric Telegraphs	6d.
2579	J. Stubbs and J. Corrigan ...	Gassing and Winding Yarns	6d.
2651	E. T. Hughes	Preserving Wood and Vegetable Fibre	6d.
2685	Duncan & Newlands	Treating Sugar	6d.
2694	T. H. Gray	Manufacture of Starch	8d.
2704	G. W. Von Nawrocki	Uniting or combining Iron and Steel	6d.
2741	S. H. Johnson	Filter Presses	8d.
2747	F. T. Bond	Filtering and purifying Water	8d.
2757	W. Clark	Apparatus for making Tea, Coffee, & other Extracts	4d.
2805	J. Mactear	Furnaces for Manufacture of Chromates ...	6d.
2815	J. H. Johnson	Extracting Metallic Zinc	6d.
2821	G. Zanni	Magneto-electric and Electro-magnetic Apparatus	6d.
2844	J. H. Johnson	Refining and Condensing Iron, &c.	6d.
2911	W. R. Lake	Cases for Preserved Food	6d.
2938	W. R. Lake	Galvanic Batteries	6d.
2941	J. W. Brown	Electric Telegraphs	6d.
3032	W. R. Lake	Cleaning Cotton Wool, &c.	6d.
3050	R. Reichenheim	Preparing Hare Skins	2d.
3055	A. M. Clark	Producing and applying Heat	8d.
3069	J. Cockshott	Dispensing Apparatus for Chemists	4d.
3078	J. Stuart	Microscopes	6d.
3094	A. M. Clark	Genratng. and Hydrtng. Sulphurous & other Gases	6d.
3095	J. W. Slater	Deodorizing and Purifying Sewage	4d.
3107	W. F. Grier	Compound for preserving Food, &c.	4d.
3124	G. Robertson	Apparatus for exhausting Gas, &c.	2d.
3145	E. S. Cathels	Purification of Gas	6d.
3148	L. Swindells and R. Lancaster ...	Manufacture of Ammonia	2d.
3160	C. Madge	Treating Tin and Terne Plate Scrap	2d.
3169	S. Pitt	Treating Silicates of Copper, Nickel, &c. ...	2d.
3170	J. Millar	Treating Sewage	2d.
3177	H. J. Haddon	Dressing Tampico and Bristles	6d.
3224	A. D. Wolochoff	Marking Divisions on Scientific Instruments ...	2d.
3236	B. J. B. Mills	Manufacture of Fecula, Farina, and Starch ...	2d.
3248	A. Brown	Producing Paintings on Textile & other Fabrics...	2d.

PROSECUTIONS UNDER THE SALE OF FOOD AND DRUGS' ACT.

BRIGHTON.—At the Hove Police-court on March 12th, a milk carrier, named Mockford, was summoned for refusing to sell milk to the inspector appointed to obtain samples of food and drugs. At the time the inspector applied for milk the defendant was going his round, and he refused to serve the inspector because he had received orders to supply only his master's regular customers. The case was then difficult to decide, as it involved a point of law. For the defence it was urged the milk was not exposed for sale at the time whilst the prosecution contended that it was. The magistrates were of opinion that the law had been infringed, and inflicted a fine of one shilling.—A dairyman named Brooks was summoned for supplying milk not of the quality asked for. The inspector asked for some new milk, and on what he was supplied with being subjected to analysis it was found to be depreciated to the extent of 25 per cent. The defendant had served several customers before the inspector, and the cream rising to the surface had been served to the first buyers, and this, the analyst said, would cause the depreciation of the milk to the extent of 25 per cent. The magistrates dismissed the case.—*Standard.*

The Election of Public Analyst for the Poplar District took place on the 27th ultimo, when Mr. W. C. YOUNG was returned.

THE ANALYST.

BUTTER FAT, ITS ANALYSIS AND COMPOSITION.

By E. W. T. Jones, F.C.S.

Read at a Meeting of the Society of Public Analysts, at Burlington House, on 14th March, 1877.

There have been two valuable papers on this subject read before this Society, nevertheless I venture to bring the matter forward again, although not with pretentions to much originality: but first, to draw attention to a few points that appear to have been overlooked by other contributors on this subject; second, to detail a method for the estimation of the soluble and insoluble acids in Butter Fat which combines expedition with accuracy, compiled from the processes of Messrs. Angell and Hehner, and Drs. Muter and Duprè, to all of whom I acknowledge my obligations; thirdly, to lay before you some trustworthy analytical results appertaining to this subject; and fourthly, to offer some remarks suggested by my analyses and work on the matter.

I had thought of restricting myself to the analysis of butter fat, but I find it convenient just to mention the empirical test introduced by Mr. Bell, of the Inland Revenue Laboratory, viz.: taking the sp. gr. of the fat at 100 Fahr. The sp. gr. test is, perhaps, of greater value than the melting point determination towards judging of the genuineness of butter fat, having an advantage over the melting point in that the observation may agree by any number of observers, with due precaution, whereas with the melting point almost every operator has his little idiosyncrasies as to manipulation, and thus results seldom compare favourably, the sp. gr. or the comparative weights of the same bulk of butter fat and water at the same temperature is more definite, and cannot differ with different observers, if done carefully. The reason I am touching this sp. gr. test is to point out the precaution to be observed in preparing a fat for taking its sp. gr. I find that fats must not be kept melted longer than absolutely necessary, or heated higher than 100°, like Dr. Muter recommends for drying butter; beyond being detrimental to the accuracy of the test, I shall show it is a procedure at least superfluous for preparing the fat for further analysis. Having observed that when butter fats were left for some time at a temperature of 50° their sp. gr. became sensibly increased, I left one under such condition during the day, and falling to ordinary temperature at night, for a period of several weeks, the sp. gr. at the commencement was 912·1, and at the end of the time was 915·9. It is highly probable that nearly this sp. gr. was attained long before this time, for I have frequently observed an advance of about 0·5 in a few hours at this temperature, but if exposed to a higher degree the increase in sp. gr. is much more rapid. To try the influence on the sp. gr. of butter fat the plan recommended by Dr Muter for drying butter, viz., treating to 100°, I took a quantity of filtered butter fat, which I carefully ascertained by two experiments had a sp. gr. 912·1, then exposed it for an hour to a temperature of 100°, using a thermometer as a stirrer, when, upon taking the sp. gr. after such treatment, I found it had increased 1·5°, or instead of being 912·1, it had become 913·6. I therefore look upon Dr. Muter's sp. gravities of butter fat

as somewhat too high. The butter in question, too, had gained weight, 36·5400 grms. became 36·5795. Now this fat had been prepared by simply melting the butter at a temperature under 100°, and, as soon as melted, and the curd, salt, &c., had subsided, decanting and filtering into a clean, dry bottle, the whole process not occupying more than an hour. Here then we have fat in a fit state to have its sp. gr. taken. As soon as possible I proceed by putting the bottle and fat upon the top of my water oven, where the temperature soon falls just below 50°, then fill the sp. gr. bottle, furnished with a thermometer and a lipped neck, which holds a supply of fat for contraction through a capillary on the stopper, when the temperature has descended to exactly 100° Fahr. the superfluous fat is immediately removed, and the bottle cleaned and weighed. I can empty the bottle, refill, and weigh any number of times with a difference of only a milligramme or so, or not at all affecting the first decimal in the gravity. The experiment shewing the effect of further heat on the sp. gr. of butter fat also proves, by no loss of weight being sustained, that the fat was dry, and in a fit state for further analysis, and I have said it was prepared by simply melting and then filtering. Another experiment was made to prove this: 5 grms. of the fat from a butter simply melted and filtered was placed in a flat dish and exposed for two hours to the heat of 100°, the loss on re-weighing was only ·0005 grm.; upon exposure for about eight hours longer, it gained ·0135, or ·27 per cent. The fat wants no special drying, simply melt the butter and filter the supernatent fat, which, IF CLEAR, is ready for general examination; if sp. gr. is to be taken, let the same be done at once, or else the fat kept solid till required.

Saponification I find very easily accomplished at about 50°, or without boiling, at such a temperature fats can be perfectly saponified in less than half-an-hour, by occasional attention and with only a little alkali, thus avoiding any error from loss of volatile acid, pointed out by Dr. Duprè.

The next point, and one of importance, in my estimation, is that the insoluble fatty acids must not be dried in an air bath, however strictly kept to 100° C, for it is impossible to get the weight constant, on account of the evaporation that goes on,—even in a water oven at full boil, a continual evaporation occurs, though not to the same extent. From some butters 5 to 10 milligrammes per hour is lost in a flat dish, with the insoluble acids, from 5 grms. of butter.

The following shews one experiment of prolonged drying:—

1st weight	61·8665
2nd, ½ hour after	61·8635
3rd, 1 "	61·8600
4th, 1 "	61·8415
5th, 1 "	61·8310
6th, 1 "	61·8310
7th, 1 "	61·8290
8th, 1 "	61·8280
9th, 1 "	61·8205

The weight of the dish was 57·4080.

The percentage of fatty acids according to the 1st weighing, is 89·17 per cent., and by the last 88·25 per cent.

The insoluble fatty acids must be dried with great care, by exposure, during short intervals, in a water oven, the surrounding water preferably only just boiling.

The solutions I employ for the saponification of the fat and estimation of the soluble and insoluble fatty acids are:—

a. Approximately semi-normal alcoholic potash solution—28 grms., roughly weighed, of the best potassic hydrate, dissolved to a litre with rectified alcohol sp. gr. 840. It is usually cloudy when first made, but if left in the flask for a few hours can be readily decanted clear enough for use.

b. Approximately semi-normal sulphuric acid—say 25 grms. of the strong acid made to a litre with distilled water. The relative strength of the potash and acid solutions must be ascertained by pipetting off 50 cc. of the potash into a beaker and noting how much of the acid is required for neutrality as a guide to the quantity of acid to be used for the decomposition of the soap.

c. Deci-normal soda solution of exact strength—

1 cc. containing ·004 Na. HO.
equal to ·0088 $C_4 H_8 O_2$

For the saponification I use flasks from 220 to 250 cc. capacity, which are carefully balanced, then 5 grms. added to the weights, and butter fat quietly poured into the flask from the small bottle into which it was filtered, until the balance shows that a shade over 5 grms. has been poured in. I either ascertain the excess by weights or else remove the same by means of a stirring rod, this latter is really easily accomplished, but, of course, it is a matter quite at the option of the operator whether he takes exactly 5 grms. or approximately such quantity. Having weighed off into flasks 5 or 6 such lots, the next step is to add the alcoholic potash solution, this I do from a fast delivering 50 cc. pipette, great care being required here to deliver an exactly like amount in each case, because an alcoholic solution does not leave the glass like an aqueous one, such difficulty however may be overcome by always allowing the pipette to *drain exactly* the same time, say half a minute. It will be observed that with semi-normal solutions any difference of one drop over or under will only make half the error that would so occur from normal solutions. 50 cc. of the alcoholic potash is delivered into each flask containing fat, and also two lots into two about quarter litre beakers, which are then put aside for telling the exact excess in deci-normal soda of the sulphuric acid used to decompose the soap. The flasks, closed with glass marbles, are now placed upon the top of the water oven, where the fat melts, and, by occasional circular agitation, saponifies at a temperature under 50° C in a short time. After perfect solution has taken place, they are allowed to remain for an hour or so, and then diluted with cold or slightly warm distilled water—the solutions must therefore still remain perfectly clear. With such dilution as I name I find it unnecessary to evaporate off the alcohol. Into each flask, and also into the two beakers containing the amounts of potash, is run from a narrow burette about 1 cc. more of the approximately semi-normal acid than that found to be required for such a quantity. If the potash neutralized 44·6 cc. of the acid, I would run into the soap exactly 46 cc. The excess of the acid over the potash is afterwards carefully found by deci-normal soda, and the two experiments should agree within a tenth or two; this quantity must be deducted from the soda taken when estimating the soluble acids.

By always proceeding in this way, and taking the relative strength of the acid and potash *pari passu* with the experiment, any error is avoided that would otherwise occur by change in the strength of the potash or difference in the temperature of the laboratory, which, too, is important, on account of the alcoholic and aqueous solutions having

TABLE III.—*Continued.*

	Q	R	S	T	U	V
Description.	?	Fresh.	?	Fresh.	?	Salt.
Sp. Gr.	Not eno'.	910·1	910·5	909·1	912·0	912·0
Soluble Acids	4·54	3·89	4·31	3·32	4·98	5·03
	...	3·85	...	3·29	...	4·91
Insoluble Acids	90·24	90·87	90·58	91·60	89·18	89·43
	...	91·00	...	91·86	...	89·11

TABLE IV.

BUTTER SUBSTITUTES AND OTHER FATS.

	A	B	C	D	E	F	G	H
Name of Substance.	Oleine Butter.	Margarine.	Margarine.	Lard.	Beef Dripping.	Mutton Dripping.	Beef Dripping.	Pork Dripping.
Sp. Gr.	904·3	903·7	904·0	904·6	...	904·1	905·8	910·2
Soluble Acids	0·24	0·17	0·33	0·10*	...	0·10*	0·12*	0·07*
Insoluble Acids	95·44	95·88	95·78	95·36	95·20	95·58	95·26	94·92

Now as to our position for detecting the adulteration of butter with foreign fat. It will be seen that the specific gravity of fat from pure butter may range from 910·5 to 913·5, the former truly is an exceptional case, but cannot be lost sight of. I am of opinion that it would be unwise to make a rule of passing over a butter as genuine, judging solely from specific gravity, whatever it may be in the face of the knowledge that the specific gravity of fats can be raised by being submitted to certain conditions of heating. If a single test is desirable for ascertaining which samples of butter are worth a full analysis, the estimation of the soluble acids is the most reliable, and scarcely less expeditious or tedious than taking the specific gravity; the small quantity of the fat required could be obtained in a few minutes, saponification effected, and, with very little hindrance to other work, the soluble acids obtained to judge of the desirability of making a full investigation, which, I consider, would be due to all butters whose fat gave practically less than 5 per cent. of soluble acid, calculated as butyric acid, but do not let me be understood to say that I should pronounce any butter adulterated, simply because it gave less than that amount of soluble acid, this would be evident folly in the face of my analyses, though I am of firm conviction that amongst them are represented more unfavourable samples than will often be met with; it may be reasonably expected that during the winter months butters are worse than at milder seasons of the year, and it was not wholly unintentionally that this time was chosen, I think it desirable to obtain the worst possible specimens of *pure* butter. I am not without grounds for believing that the soluble acids in genuine butter, made during the summer months, will be always well over 5 per cent., indeed nearer 6 per cent. It is not unworthy of remark that every sample of *salt* butter that I have examined has given over 5 per cent. of soluble acids, a decomposition of the natural butter fat being probably prevented by the salt, for I find that salt butters may be left for a week or two without depreciation, as far as soluble acids are concerned; on the other hand, that it is desirable that "fresh" should be melted at once, and the curd and water allowed to subside, after which the fat may be kept for a long time without depreciation for analyses. I am fully persuaded that the low per centage of soluble acids in some of my samples of genuine butter is due to fermentative changes before churning the cream, which is not so abundant during the winter

* Experimental errors.

months, and is kept longer. In French butter the soluble acids seldom reach 5 per cent., which may be due to depreciation, the custom in France being for each butter maker to send his butter on to the market in a rough lump, these lumps are purchased by the wholesale dealer, who blends them together to make one quality and colour, during which process it is likely a change may occur. At the farm where B and D, table I., were made, "butter powder," made by a firm of Pharmaceutical Chemists at Lincoln, consisting of bicarbonate of soda, with about 4 per cent. of carbonate of magnesia, is used; this has probably some influence on the composition of the fat.

I have made two or three experiments, proving that butter fat being washed with warm water does not alter in composition.

I have determined the soluble acidity generated by keeping, for a short time, five samples of fresh butter, the extreme outside being rejected. Some of the remainder being treated with hot water gave the following results:—

	Per centage as Butyric Acid On Butter.	On Fat.
No. 1, 5 days	·077	·09
" 2, 6 "	·038	·04
" 3, 17 "	·111	·14
" 4, 18 "	·115	·13
" 5, 18 "	·114	·17

It will be remembered that Dr. Muter, in his paper, and also in his remarks on Dr. Dupré's paper, said, he "considered no analysis of butter perfect unless the soluble and insoluble acids together reached 94 per cent." and as Dr. Dupré's figures rarely did so, he looked upon his soluble acids as generally too low; now I am inclined to agree with Dr. Muter, that the soluble and insoluble acids together should amount to about 94 per cent., which, be it observed, is the case with almost every one of my analyses, but, I think, that if anything was wrong with the analyses Dr. Dupré put forth, it was that the insoluble acids were too low. Dr. Dupré himself recognized a difficulty in not getting 100 per cent. when the acids were calculated into their respective glycerides, but considered it due to reckoning the soluble acids as butyric, when some higher acids were present, this is probably a correct explanation for a degree, but, I think, the volatility of a *portion* of the insoluble acids is the main cause of the deficiency. If the mean of my results of the sample sent to Dr. Dupré be calculated into glycerides, they will be found nearly to make the 100 per cent.

In the discussion which took place—

Dr. Muter said that if by his paper he led anybody to suppose that he heated his fat higher than 100°, it was an extraordinary oversight on his part, he strongly repudiated it, and any one who knew his process, which he described, would bear him out that he never had such an intention. In a discussion which took place on a paper by Dr. Redwood at a previous meeting, he especially referred to the change which took place in butter fat by keeping it hot. He thought he could account for Mr. Jones' high soluble acids; he received a sample of the same butter as Dr. Dupré did, and analysed a portion himself for which, therefore, he could answer. What he did was the insoluble acids; he made them 89·00 exactly, so that Dr. Dupré and himself, working independently, agreed. After having poured off the first soluble you have invariably to boil; unless you boil the water, you cannot completely dissolve out the soluble acids. He used an upright condenser, and washed his acids with boiling water—he learnt that from Mr. Wigner—the upright condenser being one of his, Mr. Wigner's, laboratory specialities.

Mr. Hehner considered Mr. Jones had furnished a very great argument against his sp. gr. test, though sp. gr. was not of the slightest use in detecting adulteration. The determination of insoluble fatty acid was a special hobby of his, and he should like to defend it against Mr. Jones, who said it was of little value. He thought Mr. Jones washed with far too small a quantity of water. He thought it was absolutly imperative to wash with boiling water, and not to let it cool. He had made several experiments with regard to the change the acids underwent by being subjected to heat, and he found that a great change does go on; the first four hours the fatty acids keep constant, then they increase and slightly decrease afterwards, but the determination is of little value compared with the determination of insoluble fatty acids.

Dr. Dupré expressed the pleasure he felt at hearing that some one had come round to his opinion that sp. gr. is of no use. As he stated in his paper the gravity is of very great importance as showing adulteration, provided it falls below a certain amount, but it is practically useless if the gravity is high. With regard to the high proportion of insoluble fatty acids, he thought the reason given by Dr. Muter, was the correct one. If the soluble fatty acids are perfectly washed he found there was really no loss by drying at a temperature of 105° for an hour, he had melted, weighed, and heated it for an hour at 104°, and then no loss had taken place. He had never considered the soluble fatty acids as any test for the purity of butter; but as a test for the impurity, he thought nothing was so safe and reliable as the insoluble fatty acids, and he was of opinion that that there was no single test as yet known which could be taken as absolute except it is the estimation of the insoluble fatty acids.

Mr. Jones made a few observations in reply.

Mr. A. H. Allen, F.C S., Vice-President of the Society of Public Analysts, Public Analyst for the Northern Division of the county of Derby and Borough of Sheffield, has been appointed Public Analyst for the West Riding of Yorkshire.

Mr. A. M. Edger, Analyst for Newcastle, reports having examined 155 samples of food, 52 of which were adulterated—these included 42 milks, 1 butter, 2 lard, 1 oatmeal, 1 tea, 1 pepper and 4 spirits.

Mr. F. Sutton, Analyst for Norfolk, reports that out of 17 samples of milk which he examined, 6 were adulterated with from 10 to 60 p.c. of water, one sample of brandy was genuine, and in the borough of Great Yarmouth 16 samples of milk were examined, 11 of which were adulterated and 5 genuine.

The following reported statement of the Archbishop of York, at Whitby, will doubtless be read with interest if not amusement.

"The fact of the matter was that a wholesale system of adulteration was going on, "and the large profits which were made by the sellers of drink could not be made "without adulteration. He found in a book that the receipt for making gin was "*glycerine and nitric acid;* he assured them it was quite true—glycerine and nitric "acid made a compound called dynamite."

Heavy Penalty.—At the Thames Police Court, on the 28th April, Alexander Harryside was fined £5, and 23s. costs, for selling mustard adulterated with 20 per cent. of wheaten flour.

We have received samples of Glass Wool from Messrs. Rohde & Co. It appears to us to be a carefully prepared material very suitable indeed for many purposes in the laboratory.

COPPER IN PRESERVED GREEN PEAS.

By Charles H. Piesse, F.C.S.

Read before The Society of Public Analysts on the 14th, Feb. 1877.

Having recently had several samples of French preserved green peas submitted to me for analysis, by the Board of Works for the Strand district, I found in each of the specimens, nine in number, unmistakeable evidence of the presence of copper.

The method which I employed to estimate the amount of the copper was as follows: I weighed out about 1000 grains of the peas, and the liquor with which they were mixed, into a porcelain basin, dried and ignited them over the flame of a Bunsen burner, and when they had burned down into a grey ash, this was suffered to cool, and then treated with a little concentrated sulphuric acid, ignited again, and finally the residual carbon burnt off in a muffle. The treatment of the ash with sulphuric acid prevents the loss of copper, which would occur from the presence of sodium chloride in the ash when the residual carbon is being burnt off at the high temperature requisite for its combustion, and it is to be noted that unless the carbon be wholly removed from the ash, the copper cannot be completely dissolved from it. The ash was next boiled with nitric acid, to which some few drops of hydrochloric acid were subsequently added, and again heated to boiling, the dish being covered with a glass lid. The solution so obtained was then carefully evaporated, diluted with water, and made strongly alkaline with ammonia, filtered, and the precipitate washed—the precaution was taken of re-dissolving and re-precipating the first precipitate. The filtrates were mixed, evaporated into a small bulk, transferred to a weighed platinum basin, and acidified with hydrochloric acid. The platinum basin was then made the negative electrode of a battery of one of Grove's cells, a strip of platinum dipping into the acid liquid being the positive electrode. A slow evolution of hydrogen at once commenced, and in a couple of hours or so the whole of the copper was separated in a bright metallic film upon the surface of the plate. The liquid was then rapidly poured out, the basin washed with hot water, dried at 100° C. and weighed.

In this way quantities of copper, weighing from 0·02 grain up to ten times that amount were obtained from the above-mentioned weights of the specimens employed.

The method of separating the copper from the acid solution by precipitating it with zinc I did not find so successful, partly on account of the impossibility of obtaining zinc which dissolved without residue. I found that the presence of the copper might be beautifully shown by placing a quantity of the peas themselves in a platinum dish, acidifying them with hydrochloric acid and making the basin the negative electrode of a constant battery; in about twenty-four hours an abundant separation of the copper in a metallic film is obtained, but I have not found that the whole of the copper is separated in that time. I would here suggest a precaution, which I, however, omitted to take, namely, that of mashing the whole of the sample, together with the liquor left for analysis, into a paste with pestle and mortar, and taking an aliquot part of that paste for analysis. The individual results would then be more concordant, though, of course, the results of the analysis of another portion of the "tin" might present the expected divergencies.

NOTE ON THE DETECTION OF ALUM IN FLOUR.

By J. Carter Bell, F.C.S.

Weigh out 50 grammes of flour and mix it thoroughly, by means of a glass rod, with 50 c.c. of distilled water, then add 5 c.c of logwood solution and 5 c.c. of carbonate of ammonia, prepared according to Mr. Horsley's method. The reason of adding so large a quantity of water is to get an emulsion of flour instead of a dough; if one ten-thousandth part of alum is present the colour of the emulsion of flour will be of a lavender blue, which blue will increase in colour according to the amount of alum present; if alum is absent the colour will be pink.

An approximate estimate of the quantity of alum in the flour may be obtained by having a standard solution of pure alum, one gramme in one litre, and measuring off 5 c.c. or less, or more into the 50 c.c. flask and filling up with distilled water and adding it to 50 grammes of *pure* flour. On adding the ammoniacal solution of logwood, a dark blue lavender tint will be developed which can be compared with the flour which is under examination.

MILK ADULTERATION IN NEW YORK.

We have received from Professor C. F. Chandler, of Columbia College, New York, one of the sub-editors of the *American Chemist*, a report of the proceedings in a somewhat remarkable milk case, which was taken as a test case, being one of some 30 which had been instituted in the court of General Sessions of New York, against members of the Milk Dealers' Association, for selling adulterated milk. According to the report, the law of the State of New York in reference to adulterated milk is of an exceedingly stringent character. The Ordinance states that "no milk which has been watered, adulterated, reduced, or changed in any respect by the addition of water or other substance, or by the removal of cream, shall be brought into, held, kept, or offered for sale, at any place in the City of New York, nor shall any one keep, have, or offer for sale in the said city any such milk."

The Counsel for the prosecution, in his speech, stated that the milk supply of New York was 400,000 quarts per day, and that according to reliable statistics in their hands, this was watered to the extent of at least 25 p.c. The most unsatisfactory part of the case is, that the milk appears to have been tested mainly, if not entirely, by means of the lactometer, and it certainly is very unsatisfactory to find that in 1877, an almost exploded method like that should be still in use on the other side of the Atlantic.

The report includes some tabulated statements as to the character of the milk given by certain cows on the farm from which the suspected sample had been taken, which cows were at this time nearly "dried up." Thus we find that eight cows, all which were within about 2 or 2½ months of calving, only yielded a total quantity of 12½ pints of milk, the quantity in one case falling as low as a half-pint, and the maximum being three pints. In only two cases, however, did the milk from these cows fall sensibly below the 100° mark of the lactometer, which, according to the report, corresponds to a gravity of 1029. The least of all was a black cow, age not stated, and the gravity of the milk is reported to have been only 1023, and fortunately we have the full analysis of this milk given. We find that the reaction was strongly alkaline, the amount of cream was doubtful, estimated at 10·50 p.c., fat 1·78 p.c. caseine, albumen and sugar 5·81 p.c., salts, ·89 p.c.; this milk therefore shows only 8·48 solids not fat, and estimating this on the

standard adopted by the Society, there is no question but that it would be considered as adulterated with 6 p.c. of water, but we note the opinions expressed in the report by the analysts called for the defence—that is those who wanted to prove that this milk was genuine—who say the milk (?) from the black cow yielded 10·5 per cent. by volume of scum, that is curdy matter, mixed with fatty globules, it also deposited a sediment, and Professor Chandler and Dr. O'Connor, who examined it for the prosecution, state as follows—"After standing a week it exhibited a strong alkaline reaction, and possessed a disagreeable taste. The microscope showed the sediment to contain pus corpuscles; this is an abnormal fluid, *which cannot properly be called milk*."

We fancy that most reported cases of pure milk of abnormally low quality would be disposed of in the same way if a similar thorough investigation were made as to the state of disease under which the cows are at the time labouring. We remember only one case of the kind in England—that of a milk dealer in London, who was fined £20 for selling milk from a diseased cow. The case is reported in the "Proceedings of the Society of Public Analysts."

GOLD AND SILVER IN SULPHIDES OF OTHER METALS.

The Comptes Rendus de l'Academie des Sciences of the 2nd of April, contains an important paper by M. Stau Mennier, wherein the author attempts to explain the occurrence of small quantities of gold and silver in the sulphides of other metals. The author's first experiments led him to the conclusion that the native sulphides have the property of reducing metals from solution, galena immersed in a solution of auric chloride is speedily covered with a coat of metallic gold, $3HS + 2Au\ Cl_3 = 3Pb\ Cl_2 + 2Au + 3S$.

If argentic nitrate be substituted for auric chloride, a kind of diana tree is formed, $PbS + 2Ag\ No_3 = Pb2\ No_3 + Ag + S$, while salts of mercury act in a similar manner.

The next series of experiments were made by allowing a solution of sodium sulphide to mix very slowly with a metallic salt, this being effected in the following manner:—two beakers were filled, one with the sodium sulphide solution, the other with the salt to be acted on, the two being then connected by means of a tube filled with water, so that the solution could only mix by diffusion. Argentic nitrate when treated in this manner, is precipitated partly as argentic sulphide, but to a great extent as metallic silver. Salts of copper and gold behave in a similar manner.

From these experiments the author believes that if galena was brought for a sufficient length of time under the influence of sea-water, (which is always argentiferous,) the former might absorb some of the silver. This would also account for the over sulphurization (sur-sulphure) of many galenas, which frequently contain such an excess of sulphur, as to be readily combustible. As the equations show, free sulphur is always formed, though a portion re-combines with the metal. In the same way gold may have been absorbed by iron pyrites.

ERRATA.

Dr. Dupré requests us to make the following corrections in his paper and letter published in our last Number.

p. 2 line 18 from top, for "1,000" read "6,000."
3 „ 10 „ after "adulteration," insert "injurious to health."
14 „ 16 from bottom, for "either," read "ether."
14 „ 2 „ for "sugar," read "single."

LAW REPORTS.

CARNRICK v. MORSON.

THE SAME v. MACKEY SELLARS AND CO.

THESE cases which came before the Vice-Chancellor Bacon on March 22nd, were of great interest.

Messrs. Carnrick Kidder & Co. of Great Russell Street, London, applied for injunctions to restrain Messrs. Morson & Son, of Southampton Row, and Messrs. Mackey & Co., of Bouverie Street, from infringing a registered trade mark used by the plaintiffs to designate a digestive compound.

It was proved that the sale of "lactopeptine," already reached £3,000 a month in plaintiffs' hands, and both the defendants had purchased it of them to a considerable amount. Lately, however, both defendants commenced manufacturing somewhat similar preparations labelling theirs "lactopepsine." The main line of defence was comprised in the affidavits of no less than five Analytical Chemists, including the President of the Pharmaceutical Society, Dr. Redwood, and Professor Tuson. These Gentlemen declared the word "lactopepsine," to be the exact scientific term indicating the chemical combination of lactic acid with pepsine, and Mr. Rogers argued that no other word or combination of words would properly describe such a combination. The Vice-Chancellor, in his judgment, however, relied entirely on the counter affidavit of Dr. Bartlett, "which affidavit," said the judge, "remains untouched and unanswered. Admitting that lacto-phosphate of soda has an exact scientific meaning, he denies that 'lactopepsine,' is a scientific combination of words, or at all applicable to precisely describe either of these preparations, which he had analysed and found to contain less than one-fifth of their bulk of these ingredients." The Vice-Chancellor proceeded to say that "this was an infringement of a plain trade mark, as palpable and wilful as ever came before any court," and he granted the injunctions, which were afterwards made perpetual, with costs.

IN Durham there have been a number of prosecutions for milk adulterations on the certificate of Mr. Edger. In the first case, a milk dealer named Thomas Milner, was summoned by Superintendent Thompson, for selling milk containing 10 per cent. of water, and the defence was that the milk consisted of strippings, and that it was really richer than ordinary milk; the defendant was fined 20s. and costs. A dealer named Corker was charged with selling milk containing 15 per cent. of water; the defence was that he "turned his cows out once a-day, and they nearly burst themselves with water"; he was fined 30s. and costs. Aaron Thompson was charged with selling milk containing 8 per cent. of water, and in defence said, "the children might have put the water in"; he was fined 15s. and costs. Robert Evans was charged with selling milk containing 14 per cent. of water, and fined 40s. and costs. James Harrison was fined 20s. and costs for a similar offence.

Mrs. Carnell, who keeps a Berlin wool repository, was charged with selling milk from which 40 per cent. of cream had been abstracted. In defence the celebrated journey of Dr. Redwood in a milk cart was again referred to as evidence, and this time with so much success that the bench dismissed the case.

William Clarke, of Red Briars, Pity-Me, was summoned by Superintendent Dunn, for selling milk from which 46 per cent. of cream had been abstracted. In answer to the charge he said that at this time of the year he mixed old milk with new, and he called some of his customers to prove that they had bought his milk regularly for 10 years, and knew it was mixed milk. The bench came to the conclusion that the evidence was "most extraordinary," and that "as the defendant had sold mixed milk for years and had no intention to defraud, they would impose the lenient fine of 10s. including costs."

At Hyde, in Cheshire, a publican has been fined £2 and costs for selling beer containing 80 grains of salt per gallon.

At Manchester there have been two more convictions for the use of poisonous colouring matters for sweetmeats. The analyst, Mr. Estcourt, proved the presence of about $\frac{3}{8}$ths of a grain of chromate of lead per ounce. The fine in each case was £5 and costs.

At the Hull police court, on the 19th April, the first summonses under the Sale of Food and Drugs Act were heard. A milkman named Horton was fined 50s. and costs for selling milk adulterated with 33 per cent. of water. A milkman named Shepherd was fined 30s. and costs for selling milk adulterated with 24 per cent. of skimmed milk. In the latter case it appeared that two samples had been procured from the defendant, and that both were mixed in the same way. The stipendiary magistrate, Mr. Travis, said he should probably inflict a fine of £5 in every future case.

REVIEW.

THE HAND-BOOK OF NATURAL PHILOSOPHY.*

By D. Lardner,

Edited by Benjamin Loewy, F.R.A.S.

On reading this book through, the only point which we see to regret is that Dr. Lardner's name should have been retained on the title page at all. For all practical purposes it is a new work, almost entirely re-written, and as far as we can judge from a careful examination of it, accurately prepared as regards the tabular matter which it contains, and carefully written as regards its facts. We think there is no doubt that it will have an extensive sale, but the circulation would not have been in any way diminished, had it been published as a new work instead of as a reprint of a perfectly obsolete one.

BOOKS, &c., RECEIVED.

The Miller; The American Chemist; The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Telegraphic Review; The Medical Record; The Geological Society's Proceedings; The Anti-Adulteration Review; The Hand-book of Natural Philosophy; The True System of Wood Pavement.

ADULTERATION IN BAVARIA.

In Bavaria it appears samples of food are so sharply looked after by the police, that although 4,727 samples of bread, 9,310 of beer, 9,782 of milk, and other articles making a total of nearly 40,000 analyses were made during the past 12 months, yet it was only necessary to take legal proceedings against 272 tradesmen, the greater number of whom were convicted and severely punished. If we may judge from the number of prosecutions we fear there is more adulteration in England than in Bavaria.

CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

ORGANIZATION AMONGST CHEMISTS.

To the Editor of "The Analyst."

Sir,—If there is any basis for the suspicions of the gentleman who writes as "One who has been in practice for twenty years," the scheme suggested or adopted for "organization" among chemists is open to still wider objection than appears in the letter in question. In the first place, I think, any protests against this, or any other possible invasion of existing and well-established professional interests, should bear our proper signatures to carry due weight with them. Chemists, of any real standing, need scarcely fear the consequences of being supposed to be left out in the cold by any self-nominated coterie.

Without invitation, and only by right, as a Fellow of the Chemical Society, I was present at a meeting held in the rooms of that Society, for the purpose of promoting organization. To my astonishment, I heard it gravely proposed "that no fees should be recoverable by any person practising as a chemist without the sanction given by the admission of the party to the privileges of the new organization."

Dr. Odling very properly ridiculed the idea, and I am surprised to hear that it has in any way survived the absurdity to which it was reduced at his hands. For myself, as I can also date back my practice for twenty years, and have no reason to be dissatisfied with its results, I am not in the least anxious to be "dubbed competent" by any self-constituted clique of organizers. I no more expect to be hindered or stopped in the exercise of my profession by any Act of Parliament which these gentlemen can apply for, than I anticipate the same fate for all engineers who are not connected with the Institute of Civil Engineers. That measure of justice which was accorded to the existing interests of the medical profession, when the medical Acts of 1815 and 1858 were passed, and still more recently in framing the Pharmacy Act, will, I am convinced, form an essential consideration for all who hope to obtain a similar measure to protect, and not to injure, the interests of professional chemists, among whom I beg to subscribe myself,

Yours &c.,

H. C. BARTLETT.

Duke Street, Grosvenor Square, W.

*Crosby Lockwood & Co., Stationers Hall Court, London.

To the Editor of "The Analyst."

Sir,—I have just been reading through the draft scheme proposed by the Committee for the organization of professional chemists, which bears the signatures of Messrs. Frankland, Abel, Voelcker, Neison, Carteigh, Wright, and Hartley, and there are a few points occurring to me in connection with it to which I should like to call attention.

1st. Who appointed this organization committee? The chemists of England, or even of London, were not invited to do so, and some of those present at the preliminary meeting, and whose names appeared in the signature book at that meeting, did not receive notice of the second meeting.

2nd. However desirable organization may be—and that it is so no chemist can doubt,—it cannot be policy, or even justice, to let ten Fellows by a majority (that is practically six Fellows only) elect the Council for such an important Trades' Union as this must necessarily be.

3rd. What would be the Council's definition of a satisfactory course of three years' training? Would they, for instance, require the School of Mines, or the College of Chemistry, or would they be satisfied with a "postal course"?

4th. Referring to p. 8, what do the promoters of the scheme understand by unprofessional conduct? If rumour is to be trusted—although we know perfectly well that *sometimes* it is incorrect,—there are chemists in practice who undertake the analysis of milk for 2s., water for 5s., or 7s. 6d., who advertise in the daily papers, and who call themselves F.C.S., without any right to do so. Are these unprofessional actions?

One more question and I have done. Is the Institute to include Chemists and Druggists, as well as professional Chemists? It appears to me, from its present constitution, that it is; if so its value must be greatly decreased.

I remain, &c.,

ONE WHO WANTS TO KNOW, YOU KNOW.

To the Editor of "The Analyst."

Sir,—Having observed that you open your columns to correspondence on the subject of "Organization amongst Chemists," I must say that, in my opinion, analysts would be glad to join a properly constituted scheme. The promoters have only to issue a public notice by advertising, inviting all practising analysts in England to a meeting on the matter.

Hitherto the fault has been that the thing has been too private, so that we in the provinces have not had a chance of putting in our word officially.

If the promoters do this the scheme will be sure to prosper, and we shall hear the last of the talk about self constituted authorities, now so common in the profession.

I am, &c.,

A PROFESSIONAL CHEMIST.

ADULTERATION OF DRUGS.

To the Editor of "The Analyst."

Sir,—I am, so far, well contented to have elicited the two letters in Nos. 355 and 356 of the *Pharmaceutical Journal*, as the writers seem at last to have come to the conclusion, however reluctantly, that manufacturers of drugs are not absolutely immaculate. I even live in hopes that in time they will fully acknowledge the justice of my statements.

Meanwhile I would take this opportunity of recommending the following propositions to the consideration of the Pharmaceutical Society, assuming, as I do, that it is the earnest desire of that Society to insure the purity of all drugs and medicines dispensed, or sold, by any of its members.

Either let the Society instruct the chemists, more or less under its control, to co-operate with public bodies in their endeavour to suppress the adulteration of drugs as well as other articles, or let the Pharmaceutical Society itself take the matter in hand, which, if I mistake not, is quite within its province. Let them exercise some supervision over its members, and prosecute every chemist who manufactures and sells pharmaceutical drugs not of the nature, substance, and quality demanded. In this it will accomplish more real good than by almost any number of prosecutions undertaken against persons practising as Pharmaceutical Chemists without being members of their Society.

In conclusion allow me to state, although considering the wording of my previous letter, such statement should have been unnecessary, that the 165 samples of drugs, &c., &c., mentioned, were *not* examined by me in my capacity of Public Analyst.

Yours, &c.,

Westminster, *April* 21, 1877. A. DUPRÉ.

MILK ANALYSIS?

To the Editor of "The Analyst."

Sir,—On the 21st of February, two samples of milk were brought to me by the inspector, which had been obtained from a milk dealer in Salford. No. 1 was a poor milk, which I passed. No. 2 gave—

Total solids	11·20 per cent.
Fat	3·13 „
Solids not fat, from ether, gave ...	8·00 „
„ „ benzoline ...	8·00 „

I reported this milk as containing 11 per cent of added water.

On the 28th of February, two samples of milk were brought to the Town Hall, with a request that they should be analysed by me.

No. 1 gave—Total solids	12·32 per cent. / 12·38 „
No. 2 „ „	12·40 „ / 12·44 „

I gave a certificate that both these milks were pure. These two milks were contained in ordinary medicine bottles, loosely corked, with 100 and 200 marked upon them. When the case of the milk which contained 11 per cent. of water came before the magistrate, the barrister for the defence asked me whether I had not analysed some milk on the 28th of February, and stated that these were parts of the very sample I had analysed on the 21st. I replied I was positive they were not, as the milk which was analysed on the 21st was analysed twice by myself, and twice independently by my assistant. The barrister said I had certified a milk on the 21st to be adulterated, and on the 28th the very same milk to be pure. The magistrate thought there was a doubt, and gave the defendant the benefit of it, but would not allow costs.

The next day after the hearing of the case a letter appeared in the Manchester papers, from the Secretary of the Milk Dealers' Association, charging me with giving incorrect analyses. To clear myself, I asked the Mayor and Town Clerk, in whose custody a portion of the sample was, to have it sent to Somerset House, and I would pay all the expenses of such analysis. This was not done; Dr. Tatham, the medical officer of health, took the bottle of milk to London, and asked Mr. Wanklyn to analyse it, and forward the results of the analysis to the Doctor. In not sending it to Somerset House, why was it not sent to some chemist in Manchester? On the 14th of April, Mr. Wanklyn sends the following analysis:—

Total solids	10·700
Fat	3·230
Ash	·640

He says he is not able to tell from the solids not fat whether the milk has been watered, on account of its age, but, judging from the ash, he should say it is a pure milk.

In Mr. Wanklyn's book on milk, he states that the ash of average country milk is ·709, and of town milk ·738, or a mean of ·72. As he judges from the ash, which in his letter to Dr. Tatham, he says is the only means of knowing whether the milk is adulterated with water, it only requires a simple calculation to see that if ·72 equals 100 of milk, ·64 can only equal 88 of milk, and according to his own analysis the milk must contain 12 per cent. of water. I wrote to Mr. Wanklyn on April 17th, calling his attention to the strange results which he had deduced from his analysis. I received no reply. I wrote him again on the 22nd, and up to this date (26th) he preserves a judicious silence.

Mr. Wanklyn probably forgot, when he returned my sample of milk as pure, because it contained ·64 of ash, that at a meeting of the Society of Public Analysts, on the 14th of June, 1876,* Mr. Wanklyn in the chair, he proposed, and it was carried unanimously, that Mr. Jones, of Wolverhampton, was perfectly justified in certifying that a sample of milk containing exactly the same amount, namely, ·64 of ash, was adulterated with 12 per cent. of water. Comment is needless.

Salford, *April 26th.* J. CARTER BELL.

To the Editor of "The Analyst."

Sir,—To a short note apropos to the milk case at Brighton, and containing the following: "No Analyst in his senses would be guilty of such a statement as the one attributed to our Brighton confrére," and inviting my reply, subject to some possible adjudication, permit me to plead not guilty, and in perfect possession of my senses at the time.

The certificate in question was for "deficiency in butter fat," given in all fealty to the Society's minimum of 2 per cent. Water was not mentioned in Court or certificate, and the depreciation *(not adulteration,)* of milk by loss of cream in its retail dipper distribution was, months back, noted by myself in the then organ of the Society, as possibly acting unfairly on the vendor.

Accepting "The Analyst" report of the recent Liverpool case, as an obligation on the vendor to a supply of the nature and substance, the Hove magistrates quoted a case which may be of some importance in the future.

You must allow me to say that I do not notice in your reprint of this case any wording that should lead to the absurd deductions conveyed in the note, or one requiring me "to explain what I really did say," and request, as you have received, so you will publish this statement, as you asked for it.

Yours, &c.,

Brighton, *3rd April*, 1877. EDWARD H. MOORE.

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*See *Analyst*, No. 4, page 77.

NOTES OF THE MONTH.

The *Pharmaceutical Journal* did us the honor, a few weeks ago, to give us one of those neat little back-handed slaps, so characteristic of Trade Journals when referring to analysts. In an article on spurious citrate of iron and quinine, which it states is now so common, it took occasion to mention Dr. Dupré's letter on drugs, which appeared in our last number, and wound up by expressing a hope that the change in our proprietorship was not to be "synchronous with a series of sensational attacks on chemists, or any other body of traders." We would remind our contemporary that, in common with himself we do not hold ourselves responsible for the opinions of our correspondents, and therefore, the insertion of any letter cannot be construed into a "sensational attack" on our part. When we commence to vituperate traders as strongly as the Trade Journals expend there spleen upon us, then it will be time for them to speak, and meanwhile it would be well for our contemporary to remember the good old adage, which says:—"don't cry out till you're hurt."

If the recent decision finally settles milk of sulphur to be sulphur and sulphate of lime, then no one should be more thankful than Public Analysts; when any disputed matter of the kind crops up, the article is sure to be poured into the laboratories by the inspectors, and a moderate analyst, who desires to delay proceedings until a test case has been tried, is certain to be talked at by local wiseacres, urging him to give them certificates of impurity, so as to let them rush into court, only perhaps to turn tail, as hereafter described. Now all that will we hope be over, and the public may be allowed to buy, and the druggists to sell, their sulphate of lime in peace, and above all the analysts will be set free from another *questio vexata.*

Just another moment's reference to the case, not to express any opinion upon its merits (although in this respect we consider that some persons go too far in utterly condemning the sale of an old-established and often useful remedy), but to point out the invidious and unfortunate position in which the Public Analyst is often placed. It cannot be too frequently reiterated that the Public Analyst ought not to have, and by the clear interpretation of the Act has not, any interest either in the collection of samples, or in the proceedings that follow. His duty is simply to receive and examine the articles brought to him by the inspectors, and to render a true account of their contents, and if, on receiving that certificate, the local authorities deem it right to prosecute, he has no *locus standi* to prevent them. Supposing then that the prosecution takes place, it is as a rule left to chance, and often no legal personage is appointed to conduct it, while on the other hand the defendant frequently secures the support of a powerful Trade Society, the best counsel are employed, and trade witnesses interested in perpetuating the manufacture of the article are called by dozens. Then the analyst is subjected to the test of a virulent and in most cases personally-directed cross examination, made purposely as galling to his feelings as possible, as if he were the actual prosecutor, while the defence witnesses are not submitted to any equivalent searching of their testimony. Almost as a matter of course the case fails, and then out come the self-constituted prophets of Israel, and denounce as incompetent, who?—not the inspector who obtained the sample, not the local authorities who insisted on prosecuting and then left the case in the lurch, but the unfortunate analyst, who throughout the whole affair has been only a

passive instrument used by others and thrown over, when convenient, as a sop to the growling wolves outside!

We are not ourselves medical men, and therefore we trust that we shall be excused for commending to the notice of that learned body a new form of monomania. It is called *analystophobia*, and its symptoms are more dreadful than hydrophobia, because instead of killing the victim off, they keep him for the rest of his life in a morbid state, always lying in wait to morally bite a victim, and suffering the most maddening suspense of mind, when a suitable pabulum for his literary teeth is not forthcoming. It condemns the wretched sufferer to hunt through every newspaper and watch every turn of events, and what is worse it causes his mind to be so completely engaged that he exists (on the point of analysts) entirely in a region of distortion, and his writings become charged with the most virulent abuse and absurd metaphor. It is bad enough for a man to be obliged to write funny things for bread, when perhaps his heart is heavy, just as Dickens' poor clown went from the bedside of his dying wife to tumble on the stage, but for a man to be so mentally chained, that he must unconsciously provide a continual source of amusement to the very class of men he hates, is one of the direst symptoms of *analystophobia*. We have had to regret lately the absence of the lucubrations of a dear and funny little enemy, but we find that he is still in existence. We are really sorry that we have not space to reprint his last effusion from the *Chemist and Druggist* for the entertainment of our readers, but any analyst who wants a little relaxation of the facial muscles should obtain a copy of his amusingly abusive letter on ourselves in the character of the Analytical Baby.

On another page we print a letter from Mr. Moore, of Brighton, in reply to our "note" of last month; we are very glad to have the opportunity of inserting the letter, because it sets at rest the point of what he actually did say in contra-distinction to what he was reported to have said. We are sorry to observe that Mr. Moore appears to have taken offence at our "note" which we thought at the time was very important, and that by eliciting the truth, we were doing him a real service, lest in reading the report, others should have taken a wrong idea as to the nature of his statement. Now that we have the true facts before us, we trust Mr. Moore will excuse us saying that we fancy no dealer in milk would wilfully give away the cream to the first comers, and the skim milk to the last, but would, for his own reputation's sake, stir up his milk every time he served a customer. Putting all this aside, however, is it not contemplated by the Act, that a man who professes to sell milk shall sell it as from the cow, and be bound to take all reasonable precautions to that end? We commend this view of the case to the legal advisers of local authorities, if indeed they think it worth while to waste a precious thought on their duties under the Act.

For some reason best known to himself, the writer of the "food reports" in the *Medical Examiner* falls foul of the present system of butter analysis. This gentleman does not think that it has been sufficiently established, that butter never yields more than the prescribed percentage of fatty acids. We were not aware that there was any such positive percentage laid down, except for the purposes of calculation, in cases where the butter exceeded the possible limits given, and fully discussed a year ago in our first number. We should be glad to see the figures upon which this writer bases his

statement, that "there is some room for suspicion, that exceptionally good butter does not conform well to the test," and until we see these figures, we may be pardoned for preferring the published results of Messrs. Angell, Hehner, Muter, Dupré, and Jones, to his unsupported statement. We remember that when Mr. Wanklyn first published his milk standards, and others carped at them, and brought forward isolated analyses calculated to throw doubt upon the researches, he always answered by simply saying that these results were merely the outcome of bad work. We think that this would be the best answer to the writer in the *Medical Examiner*.

The *Grocer*, of the 21st April, devotes nearly a column to the consideration of "THE ANALYST." We cannot say very much for the article, but still we think it is on the whole the best in the number. It considers that although "THE ANALYST" is not a large periodical, yet its articles are of a profound character, and cheap at sixpence. We really feel flattered.

A correspondent of the *Chemist and Druggist*, who signs himself "Bella Donna," states that a short time since he was at a dairy where churning was going on, and as the butter would not come, a few coppers were put into the churn in the proportion of about one penny to a pound of butter, in order to cause the more rapid separation of the fat, and he also states that he has since been informed it is not an uncommon practice; under these circumstances it is very possible that copper may occasionally be found in butter if the practice is as common as "Bella Donna" supposes.

RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Southampton Row, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
2755	J. H. Johnson	Balances	6d.
2778	C. H. Gill	Sugar	8d.
2966	F. A. Lockwood	Treating Leather or Hides	1/2
3006	R. J. Hutchings	Tin Terne and Metal Plate	6d.
3056	E. V. Gardner	Explosive Compounds	6d.
3119	W. R. M. Thompson	Drying Tea	6d.
3125	A. Fryer	Treating Refuse	6d.
3164	P. Brotherhood	Compressing Air	6d.
3173	W. Young	Carburetting Air and Gases	8d.
3209	L. De La Peyrouse	Manufacture of Gas	6d.
3213	J. Wotherspon	Asbestos Paper and Millboard	2d.
3227	T. Baldwin and W. H. Bailey	Pressure Gauges	6d.
3264	A. M. Clark	Dynamo Electric and Magneto Electric Machines	1/10
3342	W. Lord and L. Kaberry	Cleaning Cotton	6d.
3880	W. Weldon	Manufacture of Sulphide of Sodium	4d.
3381	Ditto	Reducing Sulphates of Potash & Soda to Sulphides	4d.
3383	Ditto	Furnaces for manufacture of Alkaline Sulphides	4d.
3384	Ditto	Manufacture of Alkaline Sulphides	4d.
3389	Ditto	Obtaining Carbonate of Soda & Alkaline Carbonates	6d.
3390	Ditto	Manufacture of Soda and Potash	6d.
3465	J. Clark	Coating Metals with Collodion	2d.
3466	D. G. Fitzgerald	Electrical Condensers	4d.
3479	J. T. Lockey	Evaporating Brine	6d.
3551	J. H. Johnson	Treating Iron Residues obtd. in Prfyng. Coal Gas	4d.
3576	W. White	Disinfecting Sewage	4d.
3623	C. W. Harrison	Compounds for Preserving Metals	4d.
3633	E. A. Cowper	Centrifugal Machines	2d.
3640	C. E. H. Rogers	Disinfecting Clothing, &c.	6d.
3674	R. Harris	Purification of Gas	2d.
3693	W. R. Watson	Sugar	6d.
3709	A. T. Becks	Preventing Corrosion in Steam Boilers	2d.
3734	L. Henry	Substitute for White Lead	4d.
4280	H. J. Haddan	Magneto-electric Machines	6d.
4329	T. L. Wadsworth	Converting Loose Granular Sugar into Cubes	6d.
4386	A. M. Clark	Generating Motive Gas, &c.	6d.
4597	E. H. C. Monckton	Electric Motors	8d.

THE ANALYST.

SOCIETY OF PUBLIC ANALYSTS.

An Ordinary Meeting was held on the 2nd May, 1877, at Burlington House, Piccadilly.

THE minutes of the last meeting were read and confirmed.

The names of Dr. James Mitchell Milne and Mr. Wm. Mogforde Hamlet, who applied to be admitted as members, were duly read in accordance with the rules.

The following papers were then read and discussed—

Mr. Wynter Blyth, "On Micro-Chemistry, as applied to the identification of Tea Leaves, &c."

Mr. E. W. T. Jones, "On Butter Fat," being an addendum to his paper on the same subject, read at the previous meeting.

Mr. Allen's paper "On some points in the Analysis of Potable Waters," was postponed till next meeting.

Mr. Wigner postponed his further paper "On the working of the Sale of Food and Drugs Act" till next meeting.

Dr. Muter's paper "On Oleic Acid" was also unavoidably postponed, owing to an unforeseen circumstance.

In our April number we published a short paper by Mr. W. C. Young, "On Alum in Bread," which we omitted to state was read before the Society of Public Analysts on the 14th March last.

The next Meeting of the Society of Public Analysts will be held on the 13th inst., at Burlington House, when it is expected that, amongst others, papers will be read by Mr. Allen, "On Potable Waters," and Dr. Muter, "On Oleic Acid."

BUTTER FAT.

By E. W. T. JONES, F.C.S.

Read before The Society of Public Analysts on the 2nd May, 1877.

IT will be remembered by those who were present at our last meeting, that my paper on Butter Fat* elicited the opinion from several quarters, that my insoluble fatty acids were too high, either from insufficient washing or from the use of ether and alcohol; to the former probable cause I at once dissented, on the ground that an extra washing gave scarcely any more soluble acidity, but since our last meeting I have made one or two experiments to throw light on this point.

Butter fat, sample D, Table I., some of the same that was sent to Drs. Dupré and Muter, was used for the experiments. It will be remembered that Dr. Dupré in "soluble acids" agrees with me within a tenth per cent., but in "insoluble acids" was 0·88 per cent. lower, and Dr. Muter, I understand, found the same amount as Dr. Dupré, this

* See *Ante* pp. 19.

practical agreement in "soluble acids," with a discrepancy of nearly 1 per cent. in the insoluble did not satisfy me as being due to a different degree of washing, which the following experiments tend to shew is really the case.

Five grammes (exactly) of the clear fat were employed in each experiment, and saponified in flasks with the same quantity of semi-normal alcoholic potash solution, acid was then added, and treated exactly as previously described. In all four experiments, after decantation of the first solution, the cakes of fat were rinsed with a few c.c. of cold water and then well agitated with hot, allowed to cool, and the washing in this way once more repeated.

	Amount of the first decantation and the two washings as first described.		Acidity of the same as Butyric Acid after deduction of excess H_2SO_4. Gramme.		"Soluble Acids" per cent.
A	650 c.c.	...	0·2384	...	4·77
B	600 c.c.	...	0·2296	...	4·59
C	565 c.c.	...	0·2314	...	4·63
D	550 c.c.	...	0·2332	...	4·66

The fat from A was treated with hot water three times, cooling and decanting after each treatment, giving a further solution of 530 c.c., having an acidity equal to 0·0132 grammes butyric acid, corresponding to 0·26 per cent. "soluble acids."

B was treated in like manner, and gave a further solution of 490 c.c., having acidity equal to 0·014 grammes butyric acid, corresponding to 0·28 per cent. "soluble acids."

C, this cake of fat was treated with hot water, well agitated in a flask and then poured on to the filter whilst melted and washed thereon with *hot* water, giving a further solution of 310 c.c., having acidity equal to 0·007 grammes butyric acid, corresponding 0·14 per cent. "soluble acids."

D, treatment as foregoing giving solution of 300 c.c., having acidity equal to 0.0058 grammes butyric acid, corresponding to 0·10 per cent. "soluble acid."

The solution from C was titrated whilst hot, and that from D allowed to cool and then titrated, heated nearly to boiling, it then retained its sign of neutrality, no separation of fatty acid occurred on cooling, thus, to my mind, proving that it is unnecessary to filter off hot, a procedure far more troublesome and risky than that of allowing to cool and decanting from the solid fat.

The following figures will shew the influence of this extra washing on the "insoluble acids." For B, ether and alcohol were employed and drying conducted as described on the last occasion, the others were without the employment of alcohol or ether.

	Insoluble fatty Acids.		Soluble Acids calculated as Butyric.		Total quantity of filtrate and washings.
A	88·22 per cent.	...	5·03 per cent.	...	1180 c.c.
B	88·40 ,,	...	4·87 ,,	...	1090 c.c.
C	88·44 ,,	...	4·77 ,,	...	875 c.c.
D	88·64 ,,	...	4·76 ,,	...	850 c.c.

The deductions from the above experiments are that although the extra washing has *not a very marked* effect upon the "soluble acids" calculated as butyric acids, the

"insoluble acids" are very materially affected thereby, the substances extracted therefore on the last portion of the washings are nothing near represented by the equivalent of butyric acid.

By the further washing, beyond that mentioned in my paper, the insoluble acids are reduced 1·46 and the "soluble acids" only increased 0·42, shewing the great difference between the equivalent of butyric acid on the factor used for the soluble acids and the actual equivalent of the bodies extracted. I look upon the analyses in my first paper as more nearly representing the composition of butter fat than would be the case if washing was carried further.

The use of ether and alcohol has but very little effect upon the amount of "insoluble acids," the continual loss of weight in the water oven is mainly overcome by the extra washing, the volatility mentioned in my paper being chiefly due to the bodies so removed.

MICRO-CHEMISTRY AS APPLIED TO THE IDENTIFICATION OF TEA LEAVES, AND A NEW METHOD FOR THE ESTIMATION OF THEINE.

By A. Wynter Blyth, M.R.C.S., F.C.S.

Read before the Society of Public Analysts, 2nd May, 1877.

I have been lately examining tea leaves, with a view of obtaining some chemical test, either peculiar to them, or at all events, restricted to the "Theine" producing plants.

The result of my experiments has been the establishment of a process of great simplicity which will enable anyone in a few minutes to pronounce whether the merest fragment of a plant belongs to the "Theine," class or not.

The procedure is based upon the well-ascertained fact, that the alkaloid already alluded to, is distributed in the woody tissue, the bark, the stem, the leaf, the flower, in short, in all parts of a "Theine" plant, and this is the more especially true in the case of the various species of Thea.

Now this "Theine" has some very characteristic properties; the most useful of these for my present purpose are, that it commences to sublime at the comparatively low temperature of 101° C.; that it sublimes from organic substances in as perfectly pure crystalline state; that the crystals have a very definite easily recognizable form, and that a $\frac{1}{1000}$ of a milligramme is distinctly seen, and may be identified by the aid of the microscope.

The details of the process I use are as follows:—

(1.) The leaf or fragment, if it is desired to examine it subsequently by the microscope, is boiled in a very small quantity of water, say a cubic centimeter, and the little decoction is transferred to a watch glass, a minute quantity of calcined magnesia added, and the whole evaporated nearly to dryness on the water bath; the extract is next transferred to the surface of a thin circular disc of microscopic covering glass, on this again is placed a thickish ring of glass, which is covered with a second circular disc of thin glass, the whole forming what I will call "the subliming cell,"—the subliming cell is placed on the surface of an iron plate, which carries a cup of mercury in which is inserted a thermometer, and the plate is fitted in the ordinary way to a retort stand.†

† I of course claim no originality whatever for this method of sublimation; in all its essential features it is identical with the one proposed and employed years ago by Dr. Guy.

On heating the iron plate, first moisture is given off and condenses on the cover of the subliming cell, and this cover may be removed and replaced by a second. In a very short time after it has become dry, a light mist is seen on the upper disc, and this mist the microscope resolves into beautifully distinct little crystals of theine—they may be identified as "theine" by re-subliming, when it will be found they will rise to the upper disc at about the temperature of 101° C. The subliming temperature of the extract itself is rather variable, the extract should be heated if no mist or crystals become visible up to as high as 220° C, and if still no crystals are obtained, the substance most certainly contains no "theine." In all my experiments I have always obtained a sublimate from genuine products derived from tea or coffee below 200° C.

(2.) The substance is boiled and treated with magnesia as before, the solution cooled, a bit of dialysing parchment folded and cut into a miniature filter form, and placed in a glass tube, which, as very small quantities are being dealt with, need be no bigger than a thimble, or a porcelain crucible may be used, which being always at hand, will perhaps be more convenient than anything else. The solution is then, by this little dialysing apparatus which I need not further detail, dialysed for twelve hours, a yellow colouring matter and theine are found in the outer liquid, a microscopic examination of this liquid, when evaporated down, will readily discover crystals of theine.

As in the former case, the fragments of the leaf or the leaf itself is uninjured, and can be put to any supplementary examination desired.

(3.) The leaf itself may be first slightly moistened, rubbed with a little calcined magnesia, put in the subliming cell, and heated as described. If the substance is derived from a theine-producing plant, a distinct sublimate of theine will be the result. ‡

The leaves, &c., of the tea plant also yield, without any preparation whatever scanty sublimates of theine, and coffee gives up a very large proportion of the alkaloid, below 110° C, but at all events in the case of tea it is most certain to operate with magnesia as described.

I may here remark, that if a small quantity, say a gramme, of finely-powdered tea be placed between two watch glasses and heated in the water bath in the usual way, on removing the upper glass, at the end of an hour or so, all round, but within, the edge, crystals of "theine" can be discovered by the microscope. It is then evident that in the ordinary way of taking the hygroscopic moisture of tea, there is some loss of theine, but this is I think too small to be regarded in mere technical processes.

I should also add that the addition of magnesia to a decoction of tea or coffee for the purpose of dialysis is not absolutely essential, since theine (somewhat scantily) dialyses without the addition of any re-agent.

The main objection to the processes I have given is their extreme delicacy, any speck of a tea leaf, which is easily visible to the naked eye, will yield its infinitesimal

‡ NOTE.—Since the above paper was written, I have discarded the rubbing of the dry or slightly moistened leaf with magnesia, and in all cases proceed as follows:—The leaf is boiled for a minute or two in a watch glass with a very little water, a portion of magnesia equal in bulk is added, and the whole heated to boiling and thus rapidly evaporated down to a good sized drop, this drop containing yellow colouring matter, magnesia and theine is poured on to one of the thin discs of glass already mentioned, and then evaporated nearly to dryness on the subliming plate, when it approaches dryness the "subliming cell" is completed by the circle of glass and cover, and in this way a sublimate is readily obtained.

group of crystals to the cover of the subliming cell, hence in the examination of a foreign leaf, any fragment of genuine tea mechanically adhering to it, may give rise to error.

It must, however, be borne in mind that a great many leaves in the vegetable kingdom will yield, by appropriate treatment, micro-chemical evidence as definite as that of tea, and the time may come, when a large proportion of minute vegetable products will be identified, not alone by the shape of their stomata, their epidermal appendages, or the structure of their ultimate vesicles, but by isolating their acids, their glucosides, or their alkaloids, and evolving a microscopical *corpus delicti* from a milligramme of crude material.

Quantitative determination of Theine. Struck with the ease and purity with which theine sublimed, it was but natural that I should attempt to work out a quantitative method of sublimation. In this, I believe, I have been successful, and according to my own repeated experiments the process I give here is both quick and accurate.

A quantity not less than 1 gramme, or more than 2 grammes of either tea or coffee, in its undried state is as finely powdered as possible, and treated in a flask with 70 c.c. of water, the flask is attached to a reversed Liebig's condenser, and the liquid boiled for one hour, the decoction, *including the powdered substance*, is transferred to a porcelain dish, about the same weight of calcined magnesia, as the substance originally taken is added and the whole evaporated down nearly to dryness, the powdery extract is now transferred to the iron subliming plate already spoken of, and covered with a tared glass funnel, the edge of which must be accurately ground, and the tube of which must be several inches long. The substance should form a very thin equal layer, within the circle of the funnel, which may be easily accomplished by a series of gentle taps.

The heat at first should not exceed 110° C, then when the substance appears thoroughly dry, it may be gradually raised to 200° C, and towards the latter stages up to 220° C. If the heating has been properly regulated there will be no distillation of empyreumatic products, but the alkaloid sublimes in the cool part of the funnel in a compact coating, cone shaped, of beautifully white silky crystals.

In order to ascertain when the sublimation is complete, the tared funnel may be cooled and weighed at intervals, or a series of tared funnels may be kept on hand, and changed until no more theine is extracted. The funnel as well as the theine, as may be expected, at the end of the process is perfectly dry, and the increase of weight is theine pure and simple.

By the method described I have made numerous determinations of theine, and have afterwards digested the powder remaining, for twenty-four hours in ether, but have failed to obtain any crystalline product; I, therefore, believe that the whole of the alkaloid is sublimed, and that the results with care are accurate.

From 1 to 2 grammes may be considered by some too small a quantity for an accurate assay, and, if so, there is no reason why very much larger weights should not be used, indeed the process is well adapted for working on a large scale, and if there ever should be any great demand for the alkaloid, would probably be employed.

There is yet another micro-chemical test which belongs to pyrology, and that is the presence of manganese in the ash of tea. The ash of a single leaf will give a distinct green manganate of soda bead, and, unfortunately for our purposes, so will the ash of a great many other leaves, but since I have never found any tea leaf without manganese, if

it should happen that a leaf in tea would not respond to this test, I should consider it conclusive evidence of a foreign leaf.

In a short discussion which took place Mr. Hehner said that Mr. Blyth's process had already been adopted on a commercial scale. A very elaborate paper was published two or three years ago on the determination of theine, giving a large number of different processes of theine determinations, and the different results. The safest method was to evaporate the tea-extract with magnesia, and extract with ether or chloroform.

Mr. Jones said if he understood the paper correctly Mr. Blyth took care to use an upright condenser during evaporation of steam, but afterwards evaporated on the open water bath. This seemed to be drawing a very fine line. His opinion was that no chemist would bind himself to swear that a leaf containing no manganese was not tea.

Mr. Wigner said he would. He had examined 600 samples of tea, but had not found one without manganese. He had carefully avoided the determination of theine in criminal cases, as he always had his doubts as to the methods. He thought what Mr. Hehner said about its being used as a commercial process was quite correct. Samples were, he believed, now coming over to this country made in that way.

NOTE ON THE COMPOSITION ON MARES' MILK,

By Dr. Muter.

I was recently consulted by the owner of a valuable foal with the view of seeing whether I could account for the cause of a persistent tendency to sickness and vomiting which had attacked the animal. I obtained a sample of the mother's milk and found no signs of pus or other indications of disease, but on analysis it showed :—

Fat	1·70	per cent.
Sugar	6·11	„
Casein, &c.	2·92	„
Ash	·50	„
	11·23	„

As the milk was far past the colostrum stage, I judged that the sickness must be due to a most abnormally rich secretion, especially in fat. To make the matter certain, I obtained a series of reliable samples of mares' milk, and made analyses of which I found the following to represent the mean :—

Fat	·50	per cent.
Sugar	6·74	„
Casein, &c.	1·67	„
Ash	·41	„
	9·32	„

Acting on the information thus obtained, the veterinary in charge, by regulating the diet of the mare, succeeded in bringing the milk to its normal condition, and when this was effected, the foal ceased to show the symptoms complained of.

The above analyses are interesting, as proving that mares' milk is normally one of the least rich in fat of the milks secreted by our domestic animals. Its analysis under certain circumstances, is also evidently most important for assisting veterinary surgeons in the judicious treatment of the troubles incident to the infancy of horses. In judging the results of such analysis, the above figures, may, in my opinion, be taken as representing the fair average composition of healthy mares' milk.

ADULTERATION IN CANADA.

We have received the Report on the adulteration of Food for the Dominion of Canada, which is the supplement to the Report of the Department for the Inland Revenue for the year 1876. The general results are worse than our returns show to obtain in this country. Thus out of the whole number of samples submitted to the analysts, 51½ per cent. were adulterated. Pepper and coffee appear to have been particularly bad, for of 19 samples of pepper only 2 were pure, and of 10 samples of coffee only 1 was pure. Perhaps the most noticeable part of the Report, in the present state of things, is that which relates to drugs. We find that of 5 samples of quinine only 1 was genuine, the other 4 being merely potable stimulants, containing only small traces of quinine, but containing a proportion of alcohol as large as is usually found in port or sherry wines. Four sorts of lozenges were, however, found to be composed of ingredients which were fairly represented by the names under which they were sold.

In reference to quinine wine, Dr. Edwards makes the remark that he is not prepared to say the samples were adulterated, inasmuch as they are sold to the public as "nostrums," and not as "official medicines. We are certainly at a loss to see on what ground he makes this statement.

Three samples of coffee are certainly deserving of a passing notice, for Dr. La Rue reports that they contained only one-eighth of their weight of coffee, the remainder, *i.e.*, seven-eighths, being a mixture of chicory and roasted peas and beans. Six samples of mustard deserve similar notice, as all of them were reported as containing 66 per cent. of wheaten flour, the remainder a mixture of turmeric and mustard. We also read of what seems to us a new adulteration, viz., half ginger and half wheaten flour. This occurs 4 times among the samples of powdered ginger analysed.

In the tabulated statements of results we notice another unique adulteration, where Mr. Ellis reports a sample of crushed sugar to be adulterated with 10 per cent. of common salt.

ADULTERATION IN DUBLIN.

We have received the report of Dr. C. A. Cameron, Medical Officer of Health for the City of Dublin for the past year. We find that the total number of analyses of food made were 975, of which 95, or very nearly 10 per cent. were adulterated; the only adulterated articles were, however, milk, butter milk, coffee and mustard. All the samples of tea, pepper, bread, sweetstuff, soda, arrowroot, and mineral waters, were found to be pure. Dr. Cameron notes one singular instance of adulteration of milk with 90 per cent. of water and 5 per cent. of cane sugar, and it is much to be regretted, that in this case, owing to a technical difficulty, the vendor was not prosecuted. There was one conviction obtained for the sale of rancid butter,—we are glad to see this and hope the same course will be taken in other districts, as the sale of such an article of food certainly constitutes an offence against the Sale of Food and Drugs Act. The total amount of fines and costs during the year was £243. Dr. Cameron goes on, in his

report, to point out the modifications which he considers desirable in the Act, and the defects which he says at present exist in it. He classes the latter as follows:—

1. That magistrates sitting in petty sessions are unable to award more than £1 as costs.

2. The fines imposed when the prosecution is undertaken at the suit of a private person are paid into the imperial exchequer, instead of, as they ought to be, to the local authority, who have to pay the costs of the analysis.

3. That a tradesman is not liable to be fined if his servant refuses to sell an article on the demand of an Inspector, although the tradesman himself may be fined for refusing to serve him.

4. That private persons cannot be permitted to prosecute under sections 6 and 7, without giving notice to the vendor of their intention to have the article purchased analysed.

5. That Section 13 is indefinite and its meaning not clear.

6. That the Inspector cannot prosecute any person who has not sold to *him*—that is, he is unable to take samples of milk from hospitals and other public institutions for the purpose of testing them, but only those samples which he has actually bought from the dealer.

It appears to us that Dr. Cameron and the Dublin police magistrates are certainly labouring under a mistake in reference to No. 3. There have been repeated decisions in London, and we believe also in the country, where a tradesman has been fined because his servant refused to sell to an inspector, and we are inclined to think that if a case were taken to one of the superior Courts, a conviction would be sustained.

We also think Dr. Cameron is mistaken in reference to No. 4. Sections 14 and 15 of the Act certainly prescribe certain formalities in reference to the division of the sample which is purchased, but these formalities are only applicable to the cases in which persons purchase the "article with the intention of submitting the same to analysis." Section 12, which it must be noted is a previous section, states that "any purchaser" of an article of food, "shall be entitled" to have such article analysed, and to receive the certificate of the result of the analysis, and the other sections provide that this certificate shall be evidence, and if the article is adulterated there can be no question that an offence has been committed under the Act. We are, therefore, decidedly of opinion that it is in the power of an independent purchaser who may have been supplied with an article which he afterwards suspects to be adulterated to have it analysed, and if his suspicion turns out correct, to prosecute for it, even though he may not have fulfilled the specific directions contained in sections 14 and 15.

ESSENTIAL OILS.

Dr. E. Davey, in a paper read before the Pharmaceutical Society of Ireland, on the 3rd April, suggests the use of a solution of molybdic acid in sulphuric acid, as a test for determining the adulteration of the essential oils, as he finds that most reducing agents and still more markedly, alcohol, when brought in contact with the solution, produces a *deep* azure blue colouration. According to his experiments the pure oils are apt to

produce this colouration under some circumstances, but by washing the oil in the first instance with water, and running off the wash-water after subsiding from the pipette, and allowing a few drops of this water to fall into a capsule containing a little quantity of sulpho-molybdic acid slightly warmed, the blue colour would be immediately apparent if any alcohol were present. In the case of oils which are heavier than water Dr. Davey suggests an addition of a little sulphate of sodium, so as to make the aqueous solution heavier than the oil.

THE PRESENCE OF AMMONIA IN SUB-NITRATE OF BISMUTH.

Pharmaceutical Journal, 21*st April*, 1877.

Mr. W. G. Piper draws attention to the fact that small quantities of ammonia are very frequently present in sub-nitrate of bismuth of commerce. He has determined the proportion in four different cases and found it to amount to ·06 per cent., ·05 per cent., ·008 per cent., and ·076 per cent. In order to determine the source of it he prepared some sub-nitrate of bismuth according to the pharmacopœia directions, and found that decomposition of the nitric acid took place, and that a certain amount of ammonia was among the products formed, so that in the solution decanted from the first precipitate he found ·6 per cent. of ammonia. It follows from this that much of the ammonia formed is removed by the wash-waters, but at the same time the bismuth still retains an undue proportion; the better the sample is washed the less ammonia it contains.

AIR ANALYSIS.

The Health Committee of Glasgow seem to be going rather ahead of the Sanitary Boards of other cities, and we think very wisely so. They are carrying on continuous observations, at different stations in the city, on the variations in the composition of the air, and have expended a considerable sum of money in fitting up a laboratory in order to determine the variations which occur from time to time in the composition of the atmosphere itself, and the character of the floating particles which are present in it. The Committee certainly deserve the utmost credit for taking a step so far in advance of any which has been taken by any ordinary public body.

HUMAN HAIR.

Dr. Erasmus Wilson has been engaged in an investigation of the number of hairs contained in a square inch of the surface of the human head. He estimates that each square inch contains 744 hair folicles, and that as a large number of these give passage to two hairs, the number on a square inch may probably be estimated at about 1,066, and the superficial area of the head being about 120 square inches, this equals about 133,920 hairs for the entire head.

ANALYSTS' REPORTS.

SOUTHWARK.—Dr. Vinen, one of the analysts for Southwark, has reported to the St. Olave's District Board of Works, that during the six months ending March 20, twelve samples of coffee and six of milk were received from the inspector of the district for analysis. All the samples of coffee were found to be genuine. Four of the samples of milk were genuine, but varied in quality. One sample was found to contain 10 per cent. of added water, and one was adulterated with 25 per cent. of added water, and deprived of 40 per cent. of cream. As this was found to have been sold by mistake, he did not recommend that any proceedings be taken, but another quantity would be obtained. He considered the Act had had a deterrent effect, and mentioned with respect to coffee, that on the last examination of samples of that article, two of the sellers were fined for selling it adulterated to the extent of 50 per cent. The samples now obtained from the same vendors were found to be genuine. In the case of the milks, five out of six shopkeepers now reported upon had been fined for large adulterations with water. Three of the samples were now found to be genuine, and two were rich in quality. The chairman of the Board (Mr. G. L. Shand) said that on the whole the report was a satisfactory one, and moved that it be printed in the annual report. This was seconded and agreed to.—*Grocer*.

CAMBERWELL.—Dr. Bernays has reported as follows:—Since Christmas last I have examined 30 samples of milk. Of these 30 samples, 10 were distinctly adulterated with water, and I have furnished our inspectors with certificates to that effect. It has been proved to the satisfaction of one of the magistrates presiding at Lambeth, that the milks were delivered in the adulterated state by the wholesale dealer. Now, this is a more serious offence than when milk is mixed with London tap-water, as the quality of the water in the country is often deleterious, and the magistrates thus considered it by imposing a fine of £10, and £2 14s. 6d. costs. In addition to the 33·3 per cent. of milks adulterated with water, No. 234 was a skimmed milk, and I gave a certificate to that effect. I find *the estimation of the ash in milk* to be more and more a necessity, *and although I am the only analyst in London who imposes this necessity upon himself*, and although this estimation is the most troublesome portion of the analysis, I shall continue the practice. In conclusion of the subject of milk, I must be allowed to observe that many of the milks, say nearly one half, were of admirable character and above all suspicion. Next to milk, butters have engaged attention Since your vestry has given directions not to purchase the cheap butters, I have not had an adulterated butter. The seven butters brought to me were salt, of fair quality, and not admixed with fat other than butter-fat. I have also analysed lards. One of them was very good; the other good until melted, when the smell was very unpleasant. Nevertheless, it was not adulterated. Of a pickled cabbage I have nothing to say beyond the fact that the vinegar was very weak, but otherwise free from all contamination. As to fermented liquors, I have examined six samples: "two beers" and "four porters." As to alcoholic contents they are very much alike, varying only between 7·21 per cent. and 8·91 per cent. of proof-spirit. And also in this they are very much alike—they contain so little hops. I have examined two gins, one rum, one brandy, and one whisky. With reference to alcohol, they may be thus arranged, meaning by alcohol proof-spirit:—No. 243, gin, 69·89 per cent.; 280, gin, 75·51; 275, brandy, 85·38; 276, rum, 88·12; 274, whisky, 92·24. Whether the alcoholic contents of spirits should not be stated by the publicans, by placing a conspicuous mark upon them, is a matter I would venture to press upon your consideration. A whisky like that of 274, although of very good quality, should be labelled "poison," unless mixed with water, and would, taken internally, readily account for the maddening and murderous effects of such drinks. You will not consider these remarks beyond my province, as it is my belief, founded upon knowledge, that we have at present very little idea of the quality of the spirits sold in different houses, and I should regard it as a favour to myself if you would allow specimens to be taken at night, and by different agencies, and on the same night. You would then have a better understanding of the danger to which society is subject, and might assist the Government by supplying facts upon which legislation might be based. In several parts of the kingdom publicans have been fined for selling spirits below a certain alcoholic strength; but, as long as the strength is not fixed, I should never consider it my duty to furnish an inspector with a certificate of prosecution.—*Metropolitan*.

MARYLEBONE.—Dr. Whitmore has reported as follows:—"The articles consisted of twenty samples of milk, nine of mustard, four of butter, four of arrowroot, three each of coffee, tea, oatmeal, and cayenne pepper, and one of preserved apples in tins. Of the samples of milk, four were diluted with water, the quantity added varying from 20 to 34 per cent., and two had been skimmed; in three of the cases the vendors have been prosecuted and fined. All the samples of mustard were genuine. Two of the samples of butter were found to have been adulterated with animal fat; in one instance to the extent of about 80 per cent., in the other 20 per cent. Summonses have been taken out against the vendors in both of these cases, but they have not yet been heard. The samples of arrowroot, were, with one exception, genuine; in the excepted sample potato starch was found. The samples of coffee and tea were all genuine; every sample of the latter contained its full average quantity of extractive matter. No foreign starches were contained

in the samples of oatmeal. The samples of cayenne pepper were all apparently unadulterated. Of the fifty samples of articles of food analysed by me during the past three months about 18 per cent. were more or less adulterated, either by the addition of something less expensive than the article itself, whereby its weight and bulk was increased, or by the abstraction of one or more of its constituents. Milk still continues to be the one article of food above all others that is most frequently adulterated, and unless greater facilities are afforded than the Act of Parliament at present gives for obtaining convictions against those who are primarily responsible for the fraud—I mean the owners of country dairies—the adulteration of this article is likely to continue. With regard to adulterated butters, it is to be regretted that they are sold as butter, and not under a name suggestive of their true composition, as it is certain that most of those compounds into which the fresh fat of mutton or beef largely enters are far more agreeable to the taste and infinitely more wholesome than very many cheap butters, which are, no doubt, genuine, but which are also disgustingly strong and rancid." The report was ordered to be printed.—*Metropolitan.*

South Staffordshire.—We give below the following statistics, which Mr. Jones has reported on the number of samples of food, drinks, and drugs, which were submitted during the last quarter, together with the result of his analyses:—

Number of Samples submitted.		Number Examined.	Number Genuine.	Number Adulterated.
District A	20			
District C	105	126	99	27
From last quarter	1			

Percentage of the samples examined found adulterated, 21·42.

Samples of	Number.	Genuine.	Adultd.	General character of the adulteration.
Arrowroot	1	1	0	
Bread	22	19	3	with alum 23·51, 34·92, and 27·66 grains respectively per 4-lb. loaf.
Butter	23	23	0	
Coffee	6	5	1	with 48 per cent. chicory.
Flour	3	3	0	
Ginger	1	1	0	
Gin	4	1	3	none injuriously; simply undue dilution, being 44·8, 44·6, & 44·2 u.p. respectively.
Lard	7	7	0	
Mustard	2	2	0	
Milk	22	17	5	with 13, 18, 17, 13 per cent. added water.
Oatmeal	25	12	13	with barley-meal 20, 21, 28, 24, 20, 24, 20, 24, 26, 24, 20, 26, 21 per cent.
Sulphur precipitated	3	1	2	contaminated with hydrated sulphate of lime 59·01 & 62·09 per cent. respectively.
Tea	7	7	0	

CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

MILK ANALYSIS.

To the Editor of "The Analyst."

Sir,—In reference to the disputed milk case which I wrote about in last month's Analyst, allow me to send the following extract from the minutes of the proceedings of the General Health Committee, held 10th May, 1877.

Borough of Salford,

Mr. J. Carter Bell, the Public Analyst for the Borough, brought under the notice of the Committee the circumstances attending the case of John Blackwell, which was heard before the Borough Bench, on the 29th March, for milk adulteration, and stated that a second sample of milk was submitted in evidence by the defendant, who swore it was part of the first sample analysed by Mr. Bell, and declared by him to be adulterated to the extent of 11 per cent. of water. Part of this second sample of milk Mr. Bell had pronounced pure, but he averred it was not the same milk as the first sample. In consequence of the conflic of evidence upon the point the Bench dismissed the case.

In the meantime a portion of the first sample was submitted by Dr. Tatham to Mr. J. Alfred Wanklyn, Analytical Chemist of London, who reported the milk as not having been skimmed, and as not being adulterated with water.

Mr. Bell, however, proved to the Committee that taking the figures of Mr. Wanklyn's analysis, and comparing them with the standards published in Mr. Wanklyn's own book on milk analyses, the adulteration of the milk with water to the extent of 11 per cent. was indisputable.

Mr. Bell had further written to 18 eminent Analytical Chemists in different parts of the country, sending them the figures of Mr. Wanklyn's analysis, and asking them if, taking these figures as correct, the milk was in their judgment adulterated.

Mr. Bell submitted to the Committee the letters received in reply from these gentlemen, who one and all pronounced in favour of Mr. Bell and corroborated his analysis.

The Committee having considered the whole case, it was resolved—

"That this Committee desires to record its unabated confidence in Mr. J. Carter Bell as an Analytical Chemist, and after a full investigation into the facts of Blackwell's case, is satisfied Mr. Bell has proved by abundant and most influential testimony that his analysis of the milk in question was correct."

Mr. Wanklyn has not yet replied to my two letters which I addressed to him on the subject.

Yours, &c.,

J. CARTER BELL.

ORGANIZATION AMONGST CHEMISTS.

To the Editor of "The Analyst."

Sir,—I should be very glad if you would use your influence to get this organization scheme worked into a shape which would be generally acceptable to chemists. Although some of your correspondents have pointed out what they consider errors of management on the part of the promoters, yet some such scheme is just what is required to put a stop to the under bidding and working for inadequate fees, which is now so common among chemists. If I cannot honestly and properly analyse a sample of milk for less than 21s., how can I expect to carry on my business when my competitor offers to do the same thing for 10s. 6d., or less.

I do trust it is not yet too late for the promoters to so re-model the scheme that there will be no difficulty in getting every chemist to join in it.

I am, &c.,

A WELLWISHER TO ORGANIZATION.

To the Editor of "The Analyst."

Sir,—Dr. Bartlett's letter is all very well in theory. I quite agree with him that every one should put their names to letters in order to carry due weight, but if Dr. Bartlett, instead of having happily dropped into a London practice, had unhappily dropped into one in a country town, where there is only work enough for two analysts, and where the irresistable tendency of myself and my opponent is to cut down one another's fees, perhaps he would have felt how difficult it is to sign a communication on such a subject with one's own autograph.

Competition in London is a trifle compared with competition in the country, where there are only one or two opponents, and if your opponent happens to be rather more favoured by the Organization Committee than yourself, it will scarcely do to sign your name and injure your prospects.

The whole thing seems to me to come to this—a Trades' Union is wanted, but it is not the part of any score of men, however well qualified they may be, to found this Organization, and even seek to register it as a joint stock company, until they ask everyone to join and give their views on the matter. I wish I could put my name, but as it is must simply sign myself,

Yours, &c.,

ONE WHO LIVES BY CHEMISTRY.

To the Editor of "The Analyst."

Sir,—I have just heard a rumour that the promoters of this scheme have, to some extent, altered their views and plans on the subject. I don't know whether this is due to the letters which have recently appeared in your pages, but as this reported change of purpose is in accordance with a suggestion I made in my previous letter, I shall be only too glad if the rumour turns out true. It is said the committee intend to invite all analysts in practice to join the organization. They have, therefore, only to take the other step I suggested, viz. :—to issue a public notice by advertisement, either in your own journal or the *Chemical News*, and invite all practising Analysts in England to a meeting on the matter.

We certainly ought to have some combination, and if this committee cannot succeed in forming one, some other steps will have to be taken. Let them be guided by an opinion which has been pretty widely expressed, and which, as far as I can judge, is the opinion of three out of four Analysts in England, and let the thing be above board, and then it will be accomplished.

I remain, &c.,

A PROFESSIONAL CHEMIST.

THE CHEMICAL SOCIETY.

To the Editor of "The Analyst."

Sir,—A few days ago I received a notice of an extraordinary meeting of the Chemical Society, and it has since come to my knowledge that a resolution will be then proposed, which, it appears to me, is of a very strange character. I do not pretend to have such special knowledge in reference to the affairs of the Society as Mr. Tribe has, because I am one of the Fellows who are very seldom able to attend, but all I can say is, that if his resolution is accepted by the Society, and only twenty Fellows are to be elected annually, the Society will, in the course of a little less than ten years, find itself in bankruptcy. If any of the Fellows will take the trouble to refer to the President's exhaustive address at the annual meeting in March last, they will see that the Society has lost during the year by deaths, removals and resignations, thirty members. It is hardly necessary to say that if only twenty new ones are to be elected each year, as the general age of the Fellows will increase, the number of losses by death will also increase, and if any such resolution as that proposed were adopted, we should find the Society by the year 1887 numbering about 700 members, instead of the 1,000 or 1,100 it ought to do.

The actual loss to the Society may be taken in another way. Last year, thanks to a clique, who, according to the learned President's address, never at any meeting numbered more than eight or nine, the number of new members elected was reduced from 103 in the previous year to 65 last year. Accepting, however, the latter figures for the purpose of comparison, and assuming that no increase would, under ordinary circumstances, take place, the loss to the Society would for the first year be £283, for the second year £378, and in ten years £7,087, or an average of £709 per annum. I am no accountant, but I think it needs little more than a glance at the accounts which appear on page 529 of the Society's Journal to see what the result of this must be.

In plain words our privileges, which are already curtailed by the supply of the Royal Society's proceedings being stopped, will then amount to three barren letters after our names and nothing more.

Perhaps this letter is too late to do any real good, but I should not feel justified if I had not raised my warning voice.

Although probably your next number may be published after the meeting has taken place, I nevertheless send it to you in the hope that you will find space for it. I must, however, express my opinion that no such proposition as that alluded to would ever have emanated from the Council, and I would rather call upon the latter to oppose the operations of outsiders when they tend to injure the Society.

Your obedient Servant,

GAMMA.

LAW REPORTS.

At Liverpool, Messrs. Maughan & Thompson were summoned for selling preserved green peas which had been coloured with copper, Dr. Campbell Brown's certificate stated that the peas contained from 2 to 2½ grs. of crystallized sulphate of copper per tin, and that this amount was equal to half an emetic dose. The defendants' solicitor produced a warranty certifying the peas to be perfectly pure and unadulterated, and on this warranty, Mr. Raffles, the stipendary magistrate, dismissed the summons. On the application of the solicitor for the prosecution the warranty was impounded.

At Garston, near Liverpool, a grocer was summoned for selling mustard, Dr. Brown certified to 25 per cent. of farina, and a fine of 2s. 6d. was imposed.

At Dudley, two grocers were charged with selling adulterated oatmeal, Mr. Jones, the County Analyst, had certified that one sample contained 20 per cent. of barley meal, and the other sample 24 per cent. of barley meal. The defendants were fined 40s. each.

At Coleshill, a sausage manufacturer was charged with selling sausages adulterated with a large percentage of bread. The defence was that the analyst's certificate did not state the percentage of bread, and also that bread is a necessary ingredient in the manufacture of sausages. The case was dismissed.

At the Thames Police Court, a man has been summoned for having in his possession methylated spirit capable of being used as a beverage and as a medicine. The defendant said he purchased the spirit and reduced it with water, sugar, and aniseed, and drank it himself, as he could not afford to buy spirits at a public house. This seems to confirm what we thought was an exploded statement that methylated spirit is in some cases used as a drink.

At Horsley, a grocer was charged with selling adulterated butter, the certificate of the analyst, Mr. Horsley, showed that it contained 20 per cent. of foreign fats; the defendant was fined 1s. and 21s. 3d. costs.

At Cardiff, a grocer was charged with selling adulterated green tea. The certificate of Mr. Thomas stated that it was an inferior sample of damaged black and green tea mixed with tea dust, 48·7 per cent. of it passing through a sieve of wire gauze, having 100 meshes to the square inch. The magistrates, in consideration of the excellent character which the defendant as a tradesman bore, said they would fine him 5s.

At Shoreditch, a baker has been summoned for selling bread adulterated with alum in the proportion of 20 gr. per 4-lb. loaf, and for some reason best known to the authorities the manager of his business was summoned at the same time. The magistrate appears to have thought both persons were guilty, as he fined the master 40s. and costs, and the manager 20s. and costs.

At Liverpool, two persons were summoned for selling confectionery adulterated with chromate of lead, amounting to 1 gr. per sweetmeat—the sweetmeats appearing to have been in the form of sugar oranges. The defendant was fined 20s. and costs.

Adulterated Drugs.—At the Sheffield Town Hall, on 17th May, J. H. D. Jenkinson, a chemist and druggist was charged with selling adulterated drugs. Some jalap was purchased at one of the defendant's shops on the 27th ult., and a pennyworth of it administered to two valuable coursing dogs, who died within ten minutes. Some more of the medicine was sent for, and on analysis was found to contain sufficient nux vomica or strychnine to cause immediate death to any person who took it. It was stated for the defendant that the nux vomica was mixed in the jalap by misadventure, and that the owner of the dogs had brought an action against the defendant for damages for £30. The Bench, taking this statement into consideration, imposed a mitigated penalty of £2 and costs.—*Times.*

Preserved Peas.—Thomas Pincham and William Beverley appeared at Wandsworth police court to answer adjourned summonses for selling tins of preserved peas mixed with copper, so as to render the same injurious to health. Mr. Corsellis, clerk of the Wandsworth Board of Works, supported the summonses; Mr. Campbell appeared for Mr. Beverley. The summonses had been adjourned, as the magistrate was not satisfied with the form of the certificate from the Analyst, as it did not state that the amount of copper was dangerous to health. Dr. Muter, public analyst to the Wandsworth district, now attended, and in the case of Mr. Pincham, said that the quantity was sufficient to be dangerous, especially if accumulative. Mr. Corsellis stated that the board did not wish to press the case, their only object being to put a stop to the sale. The defendant urged that he had withdrawn the sale. Mr. Campbell contended that 1½ grains in a tin was not sufficient to be injurious to health, and read the certificate of Professor Attfield, who had analysed a certain number of tins of preserved peas from the importers, stating that copper might be taken in small doses as a tonic, and quoting *Periera* to that effect. Mr. Bridge remarked that the same thing might be said of *strychnia*, which, in small doses, was an excellent tonic. Dr. Muter referred to other cases in point, and said several well-known scientific men had given an opinion that this copper was injurious to health. Mr. Campbell wished for an opportunity to call witnesses. Dr. Muter said that they might obtain any number of witnesses on either side. The question turned upon the theory of what amount of copper would kill after a certain time. Mr. Campbell said he should like to have the question finally settled, for at present the importers did not know what to do. Before the Act was passed not any mixture was allowed, now an infinitesimal part was permitted, and the question was whether it was exceeded. Mr. Bridge said an adjournment would only lead to a settlement of the case before him. He suggested that the defendant (Mr. Beverley) should submit to a conviction, and appeal. Mr. Campbell having consulted with the parties, accepted the suggestion, and said they wished to have the case settled, as at present they did not know what course to take. Mr. Bridge then fined each defendant £1, and 12s. 6d. costs, and fixed the amount of sureties in Mr. Beverley's case, himself in £100 and two bail in £100 each, in case the appeal was prosecuted.

Warranty of Adulterated Butter.—A further report was recently submitted from the Hackney Sanitary Committee stating that the Inspector, Mr. Watts, took out a summons against a person in the High Street, Kingsland. The Inspector went and asked for half-a-pound of butter, and paid for it, and on informing the vendor the purpose for which he had purchased it, his attention was called to the following words stencilled on a paper enveloping the article, namely—"Notice. This compound is warranted sold as imported, and declared according to the Act, section 8." The article sold having been found on analysis to contain 33 per cent. of butter fat, 45 per cent. foreign fat, with 22 per cent. of water, salt and curd, the summons was taken out to obtain a decision on the validity of the notice, especially as the analyst believed that the fat could not be added for any other purpose than fraudulently to increase the weight and bulk of the butter. On the hearing, Mr. Bushby decided that the declaration printed on the paper protected the vendor and dismissed the summons. This was an important decision, and the committee thought it right to submit

the question for the consideration of the Board, as unless the Board thought it advisable further to contest the question, no summons would in future be taken out by the inspector in similar cases unless the analyst would certify that such mixtures or compounds were injurious to health. If the Board thought a higher judicial decision should be obtained, a further summons would be taken out, as the magistrate was prepared to grant a case. After discussion, it was resolved by 14 against 9 to refer the question to the Clerk, for consideration as to whether a fresh summons should be issued to try the point of law in a higher court. Dr. Tripe submitted his quarterly report as analyst of the district, but it contained nothing of special interest beyond the fact that he had analysed 30 samples of food, 29 of which were received from the inspector.

NOTES OF THE MONTH.

We print a communication from Mr. Carter Bell, giving the conclusion of his disputed milk case. No one who has followed the history of the affair, will fail to give Mr. Bell his sympathy. It is surely somewhat remarkable that the person who first brought out the standard of 9·3 per cent. solids not fat, and afterwards opposed in our Society the lowering of it to 9·0 per cent., should be the very man to go against that standard, on the poor excuse of an ash of ·64 per cent., which does not even seem to have been examined for possible, and indeed probable, mineral additions, although the use of boracic acid is so common in the milk trade; but alas, *tempora mutantur et nos mutamur in illis.*

We observe in the *Sanitary Record*, the details of a process for the valuation of the amount of proteine in vegetable articles of diet, such as flour. It is simply the extension of the well-known albumenoid ammonia process for water, to a mixture of flour and water. The author holds that the amount of ammonia generated from the vegetable albumenous bodies is constant, but he only claims for his process a "*fair approximation.*" The importance claimed for the process as distinguishing between flour and starch (arrowroot) by the small per centage of ammonia yielded by the latter, would scarcely be recognised by any analyst expert with the microscope. To give confidence to chemists, the author would have done better if he had detailed the experiments by which he is enabled to "warrant a parallel statement in the case of vegetable proteine," to that he had already made as to animal albumen when proposing his water process. Until we can obtain a method of actual estimation we shall prefer to stick to the present system of combustion.

Dr. Mills' Colorimeter is, in its way, a useful instrument, and, as such, received a due notice at our hands when it was first brought out. We now, however, observe that in his paper, the author points out its "*use*" for milk, which, we think, is a pity, as for this purpose it must be really worthless. It is quite possible that, using the same milk, a good approximate guess might be made as to the quantity of water that had been purposely added for illustrating the use of the instrument, but before any real application of the article to the detection of adulteration is attempted, it would be necessary to ensure the presence of a constant number of suspended fat globules in any given bulk of natural milk. Unfortunately we have enough difficulty to persuade some investigators that the standard of 9 per cent. "solids not fat" is fairly constant without trying to work upon so self-evidently bad a conclusion as that the fat is also uniform.

We are sorry that we cannot agree with the remark made by the Chairman of the St. Olave's District Board, as to the satisfactory nature of the Analyst's report, if the paragraph which we reprint from the *Grocer* be correct. Surely something more was contemplated by the legislature than the analysis of 12 samples of coffee, and 6 of milk, during a period of six months, in a populous and poor district of the Metropolis. We hold that Inspectors, to properly perform their duties, should obtain at least one sample per diem, and should, as far as possible, not run upon any one article, but should vary their purchases so as to give every trade a fair share of inspection. Up to the present the milkmen and grocers have had far too great a share of attention, and the other trades who deal in articles of food, drink, and drugs have been neglected, except in some few districts. No doubt this is to a great extent owing to the Analysts having no control whatever over the Inspectors, but we hold that, where an Analyst cannot help noticing that the inspection is not sufficiently extended, he should inform his local board of the fact in his quarterly report. Another point in Dr. Vinen's report, which does not seem to us satisfactory, is that he says, in some cases "he did not recommend that any proceedings be taken." This is quite stepping out of his functions as an Analyst, and he has no right under the Act to "recommend" either one way or the other. It is through such expressions that the public are induced to believe the statements of the persons interested in supporting adulteration, who always try to throw the blame of all proceedings on the Analyst, and represent him as a public informer, so as to prejudice unthinking persons against the Acts regulating the Sale of Food. It cannot be too often repeated that the Public Analyst has no interest whatever in prosecutions, and has no power to either institute or prevent them.

The *Pharmaceutical Journal* waxes facetious over the head of some recent prosecutions for copper and chromate of lead in articles of food, saying it is sad to think how persistently the public will continue to demand poisonous articles in spite of the efforts of the Analysts. We were not aware that Analysts were charged with any necessity to make such efforts, and we have always thought that it was the inspectors appointed under the act who looked after the public interests in this matter. We at last fancy we see the meaning of the word "competent" as applied to Public Analysts by the various secret opponents of the present food legislation, viz.: that the "competent" analyst is one who shall shut his eyes entirely, and simply pass over anything found in food short of Strychnia or Prussic acid. It should also be noticed that an ignorant cook or a small child preferring bright green peas and bright yellow sweets, respectively, and buying them when temptingly advertised or exposed for sale, constitutes a persistent demand on the part of the public for poisons, which, if it cannot be openly encouraged in words in a respectable journal, can be secretly supported by attempting to laugh down those who are "incompetent" enough to do their duty.

We reprint from the *Times* the report of some proceedings at Sheffield, headed "Adulterated Drugs," which resulted in a druggist being fined £2, for selling jalap mixed with nux vomica. We should suppose that the defence of misad- set up in the case was true, as the mixture is one which no trader would, we

fancy, deliberately make use of. The occurrence is, however, worth a passing note, seeing that the calling in of the "incompetent analyst," and consequent elucidation of the nature of the jalap, probably resulted, in this instance, in the saving of several human lives. One of our special trade friends, the *Chemist and Druggist*, gave prominence last month to the opinion of the pre-eminently eminent scientific gentleman who conducts the "corner for students," that the aspirants for the prizes offered by the journal had failed so miserably in detecting a mixture of ammonia and potash alum, that even "public analysts could scarcely have done worse." We experience an intense feeling of relief, after such an awful utterance of this Daniel come to judgment, when we find one analyst who can admittedly detect nux vomica in jalap. However, let us not be too sanguine because who knows but what the nux vomica was never there at all, and that the dogs deliberately went and bought strychnia, and thus committed suicide, incited thereunto by the analysts, just to spite the drug trade! We trust, in writing this note, we shall not be understood to advance the absurd proposition that the sacrifice of a few miserable canine, or even human, lives could ever justify the prosecution of a member of the trade over which the *Chemist and Druggist* deigns to throw the light of its protective countenance, and so we may, perhaps, as yet be spared the use of the "padded room," announced in the same journal as being in preparation for the meetings of the Society of Public Analysts. If, however, we lived in Sheffield, where such misadventures may occur at the easy price of £2, we should, when offered a pennyworth of jalap, say, with Macbeth, "throw physic to the dogs, I'll none of it."

Dr. Bernays' report, reprinted on another page, contains a most remarkable statement; if it is correctly quoted in the *Metropolitan*, he says, "I find the estimation of the ash in milk to be more and more a necessity, and although I am the only Analyst who imposes this necessity upon himself, and although this estimation is the most troublesome part of the analysis, I shall continue the practice." We feel that we should not be doing our duty if we allowed such a statement as this to pass unchallenged. The estimation of the ash in milk has *always* been a necessity, and we certainly cannot see in what way it becomes more and more so, unless it be that Dr. Bernays suggests, or intends to suggest, that borax and carbonate of soda are used more frequently than they used to be. We must also dissent most emphatically from Dr. Bernays' statement that he is the only Analyst in London who imposes upon himself the necessity of estimating the ash in milk, and until now we were not aware that the taking of an ash was the most difficult part of a milk analysis, However, we live and learn, and are always thankful to receive information.

The recent prosecutions for selling American Hams, wrapped in canvas which was colored with chromate of lead, although unsuccessful, appear to have borne good fruit, as the *Grocer* of the 26th May publishes a letter from Messrs. F. A. Ferris & Co., of New York, in which they state that they are "under the conviction that the public will now demand the entire abolition of the use of chromates," and have "decided to abandon the use of colouring matter altogether in canvassing their trade mark hams and breakfast bacon, unless their dealers specifically order to the contrary."

RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Southampton Row, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
328	A. M. Clark	Evaporating Saccharine Juices	4d.
3429	R. C. Richards	Uterine Appliances	4d.
3593	B. Hunt	Preserving Food	10d.
3670	C. A. Faure	Thermo-electric Generators and Electro-motors	6d.
3703	J. M. Richards	Apparatus for perforating Pills	6d.
3719	G. D. Mease	Steam-power Furnaces for manufacture of Sulphate of Soda and Potash	4d.
3731	J. B. Orr	Treatment of Textile Fabrics printed or dyed with Aniline black	2d.
3743	J. Mc Kendrick and H. W. Ball	Distilling Water	6d.
3756	F. Wirth	Treating spent Oxide of Iron to obtain Sulphur and Prussian Blue	4d.
3769	W. and J. Garroway	Refining Mineral and other Oils	2d.
3778	R. Goundry	Treating Coffee	2d.
3782	J. L. Pulvermacher	Appliances for Generating and Applying Electricity ...	8d.
3843	J. J. Sachs	Treating Animal and Vegetable Substances for Impregnation or Exhaustion	2d.
3849	W. P. Tilton	Preparing Mattters for purifying Syrups, Oils, &c. ...	4d.
3894	W. Young, A. Neilson & A. Young	Destructive Distillation of Bituminous Substances ...	6d.
3902	M. Lyons	Medicated Sweetmeats	2d.
3931	G. Buchanan	Fibrous Material to be used for Paper Pulp	2d.
3945	A. L. Briggs	Preparing Cotton and other Fibrous Substances ...	4d.
3949	E. Brook and A. Wilson ...	Apparatus for making Gas	6d.
3965	J. Steel	Apparatus for Purifying and Condensing Gas	6d.
3970	R. Kemp	Microscopes	6d.
3993	W. Webster, Jun.	Applying Endosmose Action to Apparatus for detecting presence of Hydrogenous Gases in Mines, &c. ...	6d.
4002	J. R. Penning	Pressure Gauges	2d.
4021	T. Barrow	Apparatus for consuming Smoke and condensing Gases and noxious Vapours	2d.
4048	G. E. Davis and J. B. Aitken ...	Treatment of Phosphate of Alumina, &c.	4d.
4054	R. J. Hutchings	Revivifying Spent Acid, &c., used for Pickling Metal Plates	2d.
4069	H. W. Walker & T. L. Patterson	Treating and utilizing Residual Liquids obtained in manufacturing or refining Sugar	4d.
4107	A. Sauvée	Treatment of Ozokerit	4d.
4126	A. M. Clark	Spray-producing Apparatus for use in Decomposing Water for Fuel	2d.
4153	J. Cole	Magnetic Apparatus for curative and remedial purposes	4d.
4553	E. Schering	Manufacture of Salycilic Acid	8d.

BOOKS, &c., RECEIVED.

The Miller; The American Chemist; The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Telegraphic Review; The Medical Record; The Geological Society's Proceedings; The Anti-Adulteration Review; Report on Food Adulteration, Ottawa.

Mr. W. Morgan, PhD., Analyst for Swansea, has been appointed Public Analyst for the County of Carmarthen.

A Contractor in the Russian Army was detected in adulterating flour; he was tried and shot within 24 hours. This is an adulteration act short and effective.

THE ANALYST.

SOCIETY OF PUBLIC ANALYSTS.

An Ordinary Meeting was held on the 14th June, 1877, at Burlington House, Piccadilly.

The President, Dr. Dupré, F.R.S., in the chair.

The minutes of the previous meeting were read and confirmed.

The scrutineers appointed to examine the ballot papers reported that Dr. James Mitchell Milne, of Glasgow, Public Analyst for Kinning Park and Dunfermline, and Mr. Wm. Mogforde Hamlet, of King's Lynn, Public Analyst for that Borough, had been unanimously elected members of the Society.

Mr. A. H. Allen, F.C.S., read a paper "On some points in the Analysis of Potable Waters," and a discussion ensued, in which Mr. Heisch, Mr. E. W. T. Jones, Dr. Muter, and Dr. Dupré took part, and Mr. Allen replied.

Professor A. H. Church, M.A., read a paper "On some recent Butter Cases at Cheltenham," and copies of correspondence which had appeared in the local newspapers were circulated amongst the members present. A long discussion then took place, in which most of the members joined, and it was ultimately proposed by Dr. Muter, seconded by Mr. E. W. T. Jones, and unanimously resolved

> "That this Society having heard Professor Church's remarks, and also reviewed the correspondence which has appeared in the *Cheltenham Examiner* and *Cheltenham Telegraph*, considers Professor Church to be perfectly justified in his stated opinion by the figures of his analyses."

A short note by Mr. Carter Bell, "On a very hard Water used in the Manufacture of Vinegar," was also read.

Dr. Muter's paper "On Oleic Acid," and Mr. Wigner's paper "On the Sale of Food and Drugs Act," were again postponed, as was also a paper by Mr. W. Thomson, "On the incongruity of the mode generally adopted of stating the results of Milk Analyses."

In connection with the above resolution we are requested by the Secretaries to state that they have received an intimation from Mr. Horsley that he withdraws from the Society of Public Analysts.

BUTTER PROSECUTIONS AT CHELTENHAM.

By A. H. Church, M.A., &c.

Read before the Society of Public Analysts, on 13th June, 1877.

On Monday, the 28th May, four cases of alleged adulteration of butter came before the magistrates at Cheltenham. The following account of the proceedings in court is condensed from the *Cheltenham Chronicle*, of May 29th, and the *Cheltenham Examiner* of May 30th.

In the first case, that of the butter bought of Mr. W. Goodhall, Mr. Horsley's certificate stated that the sample was adulterated with foreign fatty matter to the extent of 16 per cent., and with water 24 per cent.; and that butter to be genuine ought not to contain foreign fatty matter, nor more than 8 per cent. of water. In cross examination for the defence, Mr. Horsley stated that "he knew Professor Church, of Cirencester, but he knew nothing about butter, while he (Mr. Horsley) had studied the

question when he was at Cork, at an establishment there. He knew Professor Bell, at Somerset House, and also Professor Culver (?), but they neither of them knew anything about this subject.

The maker of the butter, Mrs. Baker, wife of a veterinary surgeon of Cheltenham, proved the genuineness of the article supplied to W. Goodhall, her dairy woman corroborating her testimony.

Professor Church was then called for the defence. He proved the due receipt of the sample, sealed with the police seal, and gave the results of his analyses. He found in the fatty part of the butter 88·94 per cent. of insoluble fatty acids, and 4·75 per cent. of soluble acids. In the butter itself he found 11·14 per cent. of water, and 1·13 per cent. of salt, fair amounts for fresh butter. He had no means of knowing on which side he was to be called. In answer to Mr. Horsley, Mr. Church said that the use of solvents as the method for the analysis of butter was one no longer recognized by other chemists, and was, he believed, peculiar to Mr. Horsley; no implicit reliance could be placed upon it.

In the face of the conflicting chemical evidence, the magistrates dismissed the case.

Of the other cases the next referred to was that in which Mr. Grice was defendant Mr. Horsley's certificate was put in by the superintendent of police. It showed:—

Real Butter	75	per cent.
Foreign Fatty Matter	3	"
Salt and Curd	5	"
Water	17	"

This butter was condemned as adulterated to the extent of 20 per cent. Mr. Horsley when cross-examined said he could not tell whether the fatty matter was mutton or beef-fat, nor did he think it had anything to do with the question. In asking him the question, the solicitor's object was to obtain a charge of perjury against him. All he would swear was that it was fatty matter, contrary to the composition of pure butter He believed that it was mutton fat, but he would not swear positively. He did not come there to tell lies. The Bench dismissed this case, mainly on the ground that the Somerset House statistics of genuine butter showed an average of 16 per cent. water.

In a third case a conviction was obtained. Mr. F. Beckingsale was fined 10s. 6d. with £1 1s. 6d. costs, for selling butter adulterated (according to Mr. Horsley's analysis) with 29 per cent. of water.

Remarks on the Preceding Cases by Mr. A. H. Church.

Two of the above cases seem to me to call for an expression of opinion on the part of this Society.

Mr. Horsley bases his conclusions as to the adulteration of butter with foreign fat solely upon the ether process. This he stated in Court repeatedly, when he exhibited his tubes and specimens. I ask, Can this process, or any other process, depending upon the use of solvents be regarded as satisfactory, especially when unchecked by determinations of the specific gravity of the butter fat and its melting point? Moreover, can any process detect so little as 3 per cent. of foreign fatty matter? Would it be worth anybody's while to incorporate so small a proportion of foreign fat with butter? It is clearly unsafe, if not impossible, to pronounce with certainty upon the existence of so slight an amount of adulteration. And there is another question which ought to be asked here,—can we regard 8 per cent. as the maximum of water which genuine fresh butter should contain?

Now I should have done nothing further than to call the attention of the Society to the three points named above, had it not been for a letter addressed by Mr. Horsley to the Cheltenham papers, and a controversy which has arisen as to the conflict of evidence in one of the cases described above. Some idea of this paper war may be learnt from the remark in the *Cheltenham Telegraph*, of June 2nd, in which my statement as to the value of the process of butter analysis relied on by Mr. Horsley is called "thoroughly discourteous and wholly unwarrantable," while the *Cheltenham Mercury* of the same date, suggests to Mr. Horsley the propriety of resigning his position of county analyst! The former paper affirms in a leader that Mr. Horsley's reliance upon the ether process is shared by Mr. A. H. Allen, Dr. Campbell Brown, Mr. Wanklyn, Mr. W. W. Stoddart, and Mr. Rugier, a French chemist. I have already learnt from two of these gentlemen, that their authority has been wrongly invoked in favor of a process, which, to say the best of it, is inadequate. But Mr. Horsley's confidence in the ether process, and his acquaintance with more modern methods are so well displayed in a letter of his to the Cheltenham papers, that I cannot refrain from reproducing that communication here, simply premising that my certificate and oral evidence clearly showed that the percentages of insoluble and soluble acids which I gave were obtained, in the usual manner, from the dry fat from the butter, not from 100 parts of the original moist sample. It is inconceivable to me that any member of this Society could make such a mistake as to add the figures of two distinct analyses together, and could then base an unwarrantable attack upon so egregious a blunder of his own. But here is the letter:—

ADULTERATION OF BUTTER.

To the Editor of the Cheltenham Examiner.

SIR,—In reference to the trial at the Police-court, yesterday, having seen the full analysis of Professor Church in this day's *Chronicle*, the discrepancy being so enormously great, it becomes a serious question as to whether the sample of butter Mr. Church analysed was *identical* with that I operated on.

From being deaf I did not hear precisely what he stated until reading his evidence in this day's paper. Therefore I trust you will allow me to place our analyses side by side:—

HORSLEY.	Per cent.	CHURCH.	Per cent.
Butter	58	Insoluble fatty acids ...	88·94
Fat	19	Soluble	4·75
Salt and Curd ...	2	Salt	1·13
Water	24	Water	11·16
	* 100		105·98

I cannot for one moment understand how Professor Church has made a statement so totally different from mine, which was confirmed by numerous experiments carefully made.

Unquestionably there has been an error committed in the per-centage given by the Professor, as you cannot make 105·98 out of 100 parts.

I am, Sir, yours respectfully,

CHELTENHAM, May 29th, 1877. JOHN HORSLEY, F.C.S.

My certificate of analysis gave the figures separately and properly; I repeated the facts in my evidence in chief; I again made the same statement in an explanation of the meaning of the terms "insoluble and soluble fatty acids," which I gave in obedience to a request from the Bench. More than this, there is no mistake in the newspaper reports of my evidence; the mistake is a peculiar creation of Mr. Horsley's, and one which he has declined to acknowledge or correct, though I privately requested him to do so.

* The error in the addition appears in the original letter in the *Cheltenham Examiner*. We drew Mr. Horsley's attention to it, but he writes, "As I have withdrawn from your Society there is no necessity for my writing any more." Editors *Analyst*.

A few words as to the experimental evidence on which I passed this sample. Although I had less than one ounce of the butter at my disposal, I made two determinations of insoluble acids and two of soluble acids; I took the specific gravity at 100° F, and the fusing point of the dry fat; and I used the microscope and polariscope. All the indications afforded by these methods were favourable, although the butter was rancid and of disagreeable smell and taste, as stated in my certificate. The specific gravity was ·912 at 100° F; the fusing point 92°—93° F, and the traces of crystalline structure were limited to a few points where the butter had been in contact with the tin-box in which it was sent. It will thus be seen that I fortified the deductions drawn from the percentages of insoluble and of soluble acids by several other tests. I continue to think that to place implicit reliance upon the ether test, and to employ it unaided as a quantitive method is perfectly indefensible.

One more last word. Mr. Horsley has followed up his first letter to the Cheltenham papers, by a second which appears in the *Cheltenham Chronicle*, of June 5th, and the *Examiner* of the following day. He asserts that Mr. W. W. Stoddart has just written to him to say, "your process and mine are identical." I do not doubt that Mr. Stoddart will take care of his own reputation, which is too solid to be injured by any misquotation or imperfect quotation of Mr. Horsley's.

Indeed Mr. Stoddart writes to me under date June 5th, "I never rely on the ether test, it is true I use it, but only conjointly with others. * * * * I never yet used the test for quantitative work. * * * It would be most foolish to pass a sample because it was soluble; at the same time it would be most rash to condemn one because it was not. In any case I should never condemn one that had so small a percentage as 3 of fat and 8 of water."

Mr. Horsley now writes (*Cheltenham Telegraph*, June 9th) "Stearin, a waxy substance not existing in butter." Comment on such a statement is needless.

Copies of Mr. Horsley's and Mr. Allen's letters to the newspapers had been circulated amongst the members, and Mr. Wigner announced that he had written to Mr. Horsley informing him of the paper which was to be read.

In the discussion which subsequently took place—

Dr. Dupré said they had rather a painful duty to perform, but it was necessary to keep their members up to their work. He knew nothing of the case before that evening, but from what he saw there in the correspondence, it certainly seemed to him that Mr. Horsley was not justified in what he had done, and when they had flattered themselves that after two or three years' work they had placed the analysis of butter in a satisfactory position, it was painful to find one of their members using a process which had been abandoned by nearly every analyst. How little the process could be relied on was clearly shown by Mr. Horsley stating that stearic acid is not contained in butter.

Mr. Allen said he was in a peculiar position. The first he saw of the matter was a report in a newspaper; in a few days he had a letter from Professor Church asking if he (Mr. Allen,) ever had stated what Mr. Horsley had in the *Cheltenham Telegraph* made him say. He at once wrote a letter to that paper giving the real facts, for which letter Professor Church thanked him, as did also Mr. Horsley. Some *five years ago*, in one of a series of articles contributed to the *English Mechanic*, he said that "animal fats in butter are best detected by shaking a small portion of the sample with a moderate

quantity of ether at the ordinary temperature," and *at that time* that was the best process known. Subsequently, at the time of the well-known "Kelly" butter case at Liverpool, there was a discussion in the *Chemical News* on the subject, and he said in a letter to that journal:—

"The success of the test evidently depends on the sparing solubility of stearin in cold æther. * * * Pure butter sometimes leaves a slight residue. * * * * Although the analyst employing the above test may possibly fail in detecting a small admixture of lard, he can scarcely miss dripping or tallow, five per cent. of the latter fat being readily recognised by the method described. * * * Of course the test makes no pretensions to scientific accuracy, but by the use of definite weights of butter and ether it forms a very valuable adjunct to (and in some cases a substitute for) the more elaborate method recently proposed."

The method there referred to was the modified ether method of Dr. Campbell Brown. The saponification method was not then known.

When he made a mixture of butter fat and tallow he could detect the tallow by that plan; they had not, however, to deal with tallow now. A true artificial butter is manufactured, and he was not at all prepared to say that that test could be used now. In fact he doubted whether much of the fictitious butter now sold would not be passed as pure by the ether test, as the treatment to which the animal fats were subjected eliminated the greater part of the stearin.

Dr. Muter said the ether process most decidedly does fail to detect butterine. He knew it because he had tried it. He had a sample of butterine that was tried with the ether test, which failed to show the separation, but when the other test, namely, fatty acids, was applied, it came out 90 per cent. of adulteration. He considered there were circumstances under which the solubility test was really of no use whatever, and it was sometimes dangerous to use it even as a kind of supernumerary test.

Mr. E. W. T. Jones thought from the analysis given by Professor Church that there was no doubt that the sample which he examined was genuine butter.

Mr. Wigner thought Mr. Jones did not go far enough. Looking at Mr. Horsley's letter, in which he adds up the figures in Mr. Church's analysis in an incorrect way, he (Mr. Wigner,) thought that Mr. Horsley was bound to withdraw such a statement as he had made.

After a long discussion the resolution referred to on page 55 was carried unanimously.

With reference to the above matter we reprint from the *Cheltenham Examiner* the following letter from Mr. Horsley. Copies of this letter and other correspondence were distributed at the meeting.

To the Editor of the "Cheltenham Examiner."

Sir,—In reference to this vexed question it will be perceived that Mr. Church in his evidence stated that there were so much insoluble fatty acids *en gross*, and that he did not find any foreign fatty matter. He does not *define* what those fatty acids were. Had he treated them with cold ether *afterwards* that would have dissolved out the *true butter fat*, leaving the insoluble, which would have rendered the matter *clearer*, as I cannot make out how I could extract so much *stearin* if it had been all *pure butter fat*.

It is here I apprehend where the error lies, but as the thing has been dismissed by the magistrates nothing more can be said about it, only it is hard for me to lay under a kind of ban without means of explanation.

With your permission I now give my process in detail and in plain language. It was only outlined in my original paper published in the *Chemical News* of 1874, which no chemist ever ventured to dispute till now, but although the outlines were then given, it is only recently that I have improved on them for police purposes, being convinced of their accuracy from numerous experiments purposely made by mixing pure butter with mutton and other fats, and I challenge Professor Church or any other chemist to disprove the facts on which my method of analysis is founded.

Horsley's New Butter Process.

1st.—The weighing. If you have not two glass or earthenware pans attached to your balance, cut out two pieces of paper of equal size and weight, using one as a counterpoise and the other for holding the butter.

2nd.—Weigh out 50 grains of the butter to be examined, then having ready a small test tube on a foot holding about three fluid drams, introduce the butter as carefully as possible with a small spatula so as to be sure of the entire quantity, and pour on two fluid drams of methylated ether of the proper specific gravity mentioned in the author's original published paper (vide *Chemical News*, 1874). Securely cork the tube, and agitate, holding in the warm hand till the butter is dissolved. Put it aside for an hour or two, and note if *any deposit* forms; if small, it may be only a little curd and salt, but if large so as to occupy some height in the tube, *adulteration with fatty matter* may be suspected. Then, to see if anything more is capable of being deposited pour into the clear ethereal solution from 15 to 20 drops or so of spirit of wine, and without agitating the tube simply put your thumb over the mouth, raise or invert it for a second or so and replace it for further observation; possibly within half-an-hour or so a larger deposit may collect, if it has been really adulterated with foreign fat.

3rd.—Separation of extra fatty matter. After standing a day or so at a temperature of say 55 deg. or 60 deg. Faht., proceed to gently pour off the supernatant bright yellow liquor A, containing the pure butter in solution into a previously weighed and marked porcelain capsule, and put it aside for subsequent operation, taking note of the tare of the vessel by which at any time you may recognise its contents. That which remains in the test tube should now be collected on a small double filter B, and washed with a little ether and spirit of wine, so as to carry through every trace of butter. This filtered liquor may be added to the dish A, and allowed either to evaporate spontaneously or be facilitated by placing the vessel over hot or warm water. When the weight of this golden coloured liquid becomes constant, put the vessel aside in a cool place for the butter to become solid and note the weight of the butter.

4th.—The double filter B, containing the washed deposit of fatty matter, &c., should now be laid open to dry in the air, the deposit scraped off and put into a watch glass. If the paper on drying leaves a greasy stain it is proof of its freedom from butter or oil. Collect this white deposit of adulteration fat into a small test tube and dissolve out the fatty matter with a small quantity of pure cold benzine; that which remains undissolved being a little curd and salt. Next get a small double filter, mark its weight on it, and then pour the clear benzine solution through it, rinsing out the test tube which may yet contain a little salt with ether. Project that upon the filter, and when all has passed through lay open the filter to dry, and weigh the salt and curd. The filtered benzine solution and washings should now be evaporated, and on cooling the melted fat becomes a more or less *hard cake*, according to the nature of the adulterating material used, *and it is in fact stearin, a waxy substance not existing in pure butter*. In all cases where a fatty acid deposit is obtained the dry matter should be again treated in a test tube with a little cold ether, when, if it does not dissolve and remains white or milky looking, it is a certain proof of adulteration with foreign fat or stearin. The bones, so to speak, of the fat used are not soluble in ether, whilst pure butter is entirely soluble, forming a clear liquid at a temperature of say 60 deg. to 65 deg. Fahrenheit. Mutton fat, beef, suet, lard, &c., contain besides insoluble stearin, another element, "Oleine," but as this has become so inseparably amalgamated with the true butter fat, the chemist adopting this or any other method rather underrates adulteration than otherwise. Nevertheless the obtainment of any appreciable or weighable proportion of solid stearin can never deceive him, that being his true indicator.

JOHN HORSLEY, F.C.S.

The following letter appears in the *Cheltenham Telegraph* of the 23rd June.

To the Editor of the "Cheltenham Telegraph."

Sir,—By the advice of Dr. Dupré, President of the "Analysts' Society," I beg to withdraw my letter of May 30th, commenting upon Professor Church's figures, which he says ought not to have been added up in that way. This occurred through the percentage of water, salt, and curd having been given, representing that proportion of 100 parts of the sample in question, and the subsequent percentage of soluble and insoluble fatty acids from or out of 100 parts of the butter fat only. Professor Church, however, explained that he meant not the percentage of the *whole* butter submitted to analysis, but of the *dry fats* extracted therefrom.

The matter of pure butter being of such public importance, I never intended to convey anything of a *personal or offensive character* towards Professor Church in my statement, and deeply regret if he should think otherwise.—I am, Sir, yours truly,

Cheltenham, June 19th, 1877. JOHN HORSLEY.

The following letter has also appeared in the Cheltenham papers, and explains Mr. Stoddart's views:—

Dear Mr. Horsley,—My mode of testing samples of butter is to put 40 grains with 2 drams of ether, and *without allowing the hand to touch the tube or phial* to agitate and lay aside. Genuine butter does not deposit more than salts, water, and curd, and remain in solution. If it does not, or deposits in an *hour or two*, I suspect something is wrong. I then fill a beaker with the butter, and leave it in the water bath to let the curds, &c., deposit. *The day after* I take the sp. gr. at 100 deg. Fahr. If above ·911, and nothing suspicious, it is doubtless butter. I then take 40 gr. of the clarified butter, and try the ether test. If it deposits as before I feel sure there is some admixture. To prove this I separate the *fatty acid* and see if they are *soluble in ether*. If butter they do, if not they do *not*. The accepted per centage of the fatty acids alone is in my opinion a *decided failure*. But the ether test, and the sp. gr. at 100 deg. are *very correct*. I find that the foreign butter (?) that is so much about now behaves just as you describe. It dissolves readily at 65 deg. in ether, but deposits in a short time while true fresh butter does not. The deposit too is always a *fatty mass*, not the *stillon crystals* that are deposited *on the tube* so characteristic of butter. I do not find the addition of alcohol always certain. *I have never been found wrong yet*. But the whole success of the experiment lies in the mode of manipulation.

May 30th, 1877. W. W. STODDART.

ON SOME POINTS IN THE ANALYSIS OF WATER, AND THE INTERPRETATION OF THE RESULTS.

By Alfred H. Allen, F.C.S.

Read before the Society of Public Analysts, 13th June, 1877.

I feel some diffidence in reading a paper on such a well-worn subject as water analysis, before a Society of Professional Analysts, but my apology is, that while I may occupy the time of the Society with what some of its members will rightly regard as truisms, the facts brought forward are systematically ignored by many water analysts, and discredit frequently brought upon the profession in consequence.

Any chemist who has had experience in the examination of potable waters, will, occasionally have found a difficulty in pronouncing an opinion on the fitness of a sample for domestic use, when neither pains nor time have been spared in gathering *data* to enable him to come to a definite conclusion. The number of cases in which this difficulty occurs, is greatly increased by the fact, that at the present time, water-analysts may be divided pretty sharply into two groups: those who practice the method of Frankland and Armstrong, and those who employ the process of Wanklyn and Chapman.

The use of one process or another is, in many branches of chemical analysis, a matter of comparative indifference; but in water-analysis, it seems often to be understood to imply a distinct belief in one set of "symptoms," with simultaneous *dis-belief* in another set.

This discreditable and unsatisfactory state of things has its origin in unfortunate differences between the authors of what may fairly be called the rival methods of water-analysis.

Of the two methods, it may fairly be said that Wanklyn's is infinitely the more popular, and is the process in general use. On the other hand it is urged that the popularity of Wanklyn's process is due less to its intrinsic merits, than to its rapidity and facility of execution; Frankland's process being admittedly one of the most delicate operations in the whole range of chemical analysis, and, according to its enemies, incapable of giving accurate results, except by accident.

Of Frankland's method of determining the organic carbon and nitrogen in water, I have not myself had any direct experience, and, owing to the small number of chemists employing it, instances of concordant results having been obtained independently, by the analysis of the sample by different chemists, are difficult to obtain. An instance, however, was made public recently, in which duplicate analyses of the same sample were made independently by Dr. Frankland, and by Mr. J. W. Thomas, Public Analyst for Cardiff. The results of the two analyses agreed closely, and I am acquainted with several other unpublished cases in which equally satisfactory agreements have been obtained.*

It may, however, be fairly open to question, whether Frankland's method would give absolute results in the case of samples containing large amounts of nitrates. It is evidently not sufficient that the sample should give concordant results in the hands of different chemists, but that test experiments should be made on known quantities of some unstable form of organic matter *in presence of a large excess of nitrates.* I am not

* Among the members of this Society, Drs. Campbell Brown and Hill are well-known to employ Frankland's method.

aware that any results bearing on this point have ever been obtained, or at least published, by Dr. Frankland or his disciples, although the objection has been so repeatedly and forcibly urged by Mr. Wanklyn, that it certainly requires some kind of answer.

As to Wanklyn's method of estimating albuminoid ammonia, the possibility of obtaining by it concordant results in the hands of independent analysts, has been repeatedly proved, and although the fact that the results are only comparative, is now fully recognized, the indications are generally regarded as exceedingly valuable.

The difficulty introduced by the fact that different kinds of nitrogenous organic matter yield different amounts of albuminoid ammonia has been greatly exaggerated; for there is every reason to suppose that the number of kinds of nitrogenous organic matter existing in water is extremely limited, and if that be the case, the amount present ought to be tolerably strictly proportioned to the albuminoid ammonia yielded on distillation. Certainly, the opinion of a very large number of chemists who employ Wanklyn's process, is decidedly in favour of it as a means of discriminating between bad and good water, though probably few place in it so implicit a reliance as its authors contend it deserves.

But although Mr. Wanklyn deserves the thanks of chemists for the introduction of his method of determining albuminoid ammonia, he has unfortunately originated a fertile source of discord, and done much to retard the development of water-analysis, by under-rating the value of the oxidised nitrogen as an indication of contamination.

Unfortunately, Mr. Wanklyn's views on water-analysis are accepted as gospel by a large number of medical officers of health, and other "sucking analysts," and his remarks are too frequently interpreted literally, without the judicious qualifications which Mr. Wanklyn himself would be the first to introduce. Thus, a member of our Society holding two appointments as Public Analyst, has expressed his belief that the determination of free and albuminoid ammonia is all that is necessary for forming an opinion on the quality of a drinking water, and he backs that opinion by pronouncing on samples submitted to him *solely* on the results of those two estimations.*

On the other hand, few chemists appear inclined to support the extreme view of Dr. Frankland, that the presence of nitrates in water (in more than minute quality) is absolutely positive evidence of previous contamination of the water by animal matter;—a view which has been contradicted by the researches of Boussingault, who found considerable quantities of nitrates in water in which contamination by animal matter was out of the question.

The grave mistake which is made by those who ignore the value of oxidised nitrogen in water as an indication of previous contamination by animal matter is evident, when it is remembered that 97 per cent. of the combined nitrogen of sewage was found by the Rivers Pollution Commissioners to become converted into nitrates during its slow percolation through a gravelly soil only five feet thick. As, therefore, free ammonia, urea, and the substances which are represented by albuminoid ammonia, are rapidly changed under favourable conditions, with formation of oxidised compounds of nitrogen, it is evident that the omission to regard the latter as indications of previous contamination is practically to ignore any infiltration of sewage, which is not *very* recent. As we

* It is worthy of notice that the average amount of free ammonia found by Dr. Angus Smith in the rain of country places was upwards of ten times as great as the maximum quality which is found in pure drinking waters, so that average rain-water would inevitably be condemned by the above *soi-disant* chemist, as being contaminated by sewage.

have good reason to believe that the organisms to which we attribute enteric diseases, resist oxidation far more energetically than dead organic matter, it is evident that all trace of free ammonia, and the greater part of the albuminoid ammonia might disappear and yet the water be dangerous to drink.

There is another circumstance connected with the presence of nitrates, especially in the water of shallow wells, which is too often lost sight of.

According to the researches of Pettenköfler and others, much zymotic disease is due to the *alteration of level* of subterranean water. This, of course, is almost synonymous with the level of the water in shallow wells. In dry weather, when the water is low, sewage filtering through the soil from neighbouring ashpits and cesspools becomes thoroughly oxidised, the nitrogenous organic matter and ammonia being converted into nitrates. But in wet weather, the soil being filled with water, the same oxidation cannot take place, and free and albuminoid ammonia appear in the water of the wells. It is evident, therefore, that a change of weather, or other conditions, may so injuriously effect the water as to change what was possibly safe, though of bad antecedents, into what all chemists agree in regarding as positively dangerous.

As pointed out by Dr. Angus Smith, whose views on water-analysis are too little known and appreciated, it is often interesting and important to distinguish between the nitrogen of nitrous acid, and that of nitric acid. As nitrates contain an atom more of oxygen than nitrites, their presence indicates a more complete oxidation and destruction of the organic matter than obtained in the latter case. If all the combined nitrogen of a water exist in the form of nitrates, it is clear that a very thorough oxidation has occurred, and therefore that the contamination is comparatively old or distant. The presence of nitrites, on the other hand, shows that complete oxidation has not occurred, and therefore that the pollution is near at hand or recent. It has also been found that some kinds of organic matter will abstract oxygen from nitrates, reducing them to nitrites, or even to ammonia. Equally, therefore the presence of nitrites indicates a recent contamination. On this account, in studying the history of a drinking water, it is desirable to ascertain whether the oxidised nitrogen exists wholly as nitric acid or nitrites, or whether nitrites are not also present.

Another point on which I believe the practice of late years has been distinctly retrograde, consists in ignoring the loss on ignition. Because the loss of weight which occurs on igniting the residue left on the evaporation of a water cannot be strictly regarded as organic matter, it has become usual to omit the determination altogether. I believe the actual loss of weight is not without its value, especially when taken in connection with the total solid matter. In a good water the loss on ignition is rarely more than one-fifth of the total weight of the residues, but even if the exact loss be disregarded, the ignition often gives valuable information which can scarcely be obtained in any other way short of an estimation of organic carbon and nitrogen by Frankland's method. Thus in presence of much organic matter, the residue blackens, and if it be of animal origin often gives a distinct smell of burnt feathers. Oxidised compounds of nitrogen of course prevent the blackening, but often give rise to an evolution of red fumes. These and similar indications make the ignition test one which the careful analyst cannot afford to omit, especially as phosphates and lead can be looked for in the ignited residue more conveniently and safely than in any other way.

In the discussion which took place—

Mr. Heisch said that there were several things said by Mr. Allen on which he would gladly have made some remarks, but as that would involve a discussion of the whole subject of water analysis, he would confine himself to one point. Mr. Allen said that he (Mr. Heisch) had introduced a delicate test for phosphoric acid, he (Mr. Heisch) repudiated this. Dr. Frankland found that growths were producible by putting together nitrate of ammonia, phosphate of soda and sugar, but he (Mr. Heisch) denied the identity of these growths, with those which he considered due to sewage. Dr. Frankland only saw his growths after they had assumed the condition of mycelium, in which state they could not be distinguished from many other growths. It was at their first formation that they were most characteristic. One of their great peculiarities was, that they did not require the presence of atmospheric air, the first place in which he had observed them being in a liquid, saturated with carbonic acid. The proper way to try the experiment was, to put about 10 grains of the purest sugar in 5 ounces of the water, in a perfectly clean bottle, which it should quite fill, and stopper it down well, then expose it to day light, at a temperature of about 70°; in the course of about 24 hours certain little bodies could be seen floating about which required carefully looking for; the best way was to put a black cloth against the wall, and look at it through the water, these bodies when examined under $\frac{1}{4}$ or $\frac{1}{8}$th objective, were found to consist of cells, with very brilliant neuclei. If the bottle was shut up a little longer, these cells would be found to group themselves something like a bunch of grapes. The grouping was very peculiar and very different to anything obtained when the bottle was left open. Ultimately the odour of butyric acid became perceptible. The great point was to exclude atmospheric air, as these germs formed without the presence of air, and in the presence of carbonic acid as well; but the bodies which Dr. Frankland found would not form without the presence of atmospheric air, these were always accompanied by bachteria and not by the formation of butyric acid. He, Mr. (Heisch,) had under his notice recently three waters which came from a place where typhoid fever had broken out; chemically he found little difference between them, but in one, when treated as described, these peculiar bodies were found, and he said if either of the waters had anything to do with the fever it must be that one. The people there were up in arms as this water happened to be a pet one, because it was supposed to come from a spring having its origin in a coppice, and was therefore supposed to be as pure as could be, but the fever increased, and Dr. Guy was sent down by the Local Government Board to examine the question, and ultimately he found the origin of the spring to be immediately under a new workhouse, and not far from the cesspools of that establishment. Of the three waters it was only in that one he (Mr. Heisch) found these bodies.

Mr. E. W. T. Jones, had had considerable experience with both the Frankland and Wanklyn processes, but was not wedded to either. Of course they all thanked Mr. Allen for his paper, though he had not brought forward anything which he (Mr. Jones) had not observed or known before, which he thought would be the case with most of those who had had much to do with water examination. No doubt, as Mr. Allen said, the Frankland organic carbon and nitrogen method was one of extreme accuracy and required the greatest care, and was therefore subject to objections from causes not due to the subject itself. He regarded that as the worst feature of the organic nitrogen method. All the circumstances connected with the determination were such as to make one liable

to errors, which would affect the process considerably, whereas by the Wanklyn albumenoid ammonia method you could with due care show that no error took place during the process of analysis. The solubility of carbonate of lime (which he thought was understood by all of them) is something like 3 in 100,000, but he could not see how it bore upon water analysis; it could not affect one at all unless with a view of getting at the constitution of the mineral matter. He held that the data should be taken *collectively* to see whether they agreed with one another. As to the influence of nitrates upon the determination of organic nitrogen, he thought that had been settled by Frankland and others of his school. He himself had obtained good results in the presence of nitrates, which he thought could be decomposed in the way Dr. Frankland said, although there was a danger of leaving some nitrogen in the residue, but, on the whole, he thought the albumenoid process was preferable.

After a few words from Dr. Muter,

Dr. Dupré said that he never omitted any one of the points mentioned by Mr. Allen. He had never had a water in which he could not detect phosphoric acid. One thing he always did, viz., testing the water itself by permanganate —*i.e.*, by taking half a litre of the water, and adding a very small quantity of permanganate; if that is decolorized a fresh quantity is added until the color remains for 1 hour. The proportion of permanganate added at a time contains 0.08 milligram of available oxygen. Sometimes if the history of a water is not known an analyst might be seriously misled, and condemn a water which he would not do if he had known the history of it, but this simple permanganate test would prevent the mistake being made. He had adopted a plan which might be useful to others. One of the great drawbacks of Frankland's process was that you must always have your Sprengel pump in order or have a room you can set aside for it, but if you have to take your pump, &c., &c., to pieces it is a tedious job. He had some success in estimating the carbon and nitrogen by the ordinary combustion process; he simply estimated the amount of carbon by the old oxide of copper method. He took no precaution about the nitrogen. He passed the gas through a carbonic acid tube which he charged with baryta water, and filtered in such a way that no carbonic acid could get at it, dissolved the barium carbonate in hydrochloric acid, and finally converted it into sulphate, 1 milligram of which corresponded to 0.05 milligram of carbon. The nitrogen he estimated in a separate portion by combustion with soda lime, and, if the amount was very small, determined the ammonia produced by nesslerising. He also considered that no water should be passed without being tested by sulphuretted hydrogen. Dr. Dupré concluded by observing that he hoped no one would be prevented bringing the subject forward again because it was old, for all of them might learn something new at each discussion.

Mr. Allen, in replying, suggested that Mr. Heisch's remarks should be published in "The Analyst," so that the members might have an opportunity of seeing them in print.

REDUCED SPIRITS.

In the House of Commons on the 14th of June, Mr. Isaac asked the President of the Local Government Board whether sub-sections 1 and 4 of Clause 6 of the Food and Drugs Act, 1875, would not exempt from penalties persons selling spirits reduced with water in the natural and customary course of trade, and without fraud to the purchaser,

whether he was aware that prosecutions had recently been instituted for reducing gin by its admixture with water, and whether, inasmuch as in such case no fraud had been practised or intended, and the sales of gin so reduced had been made at a lower price, such prosecutions were in accordance with the intentions of the Act; and whether, if there existed any doubt as to the interpretation of the Act, he was prepared to introduce an amending Bill to exempt from penalties persons who sell gin reduced with water and not otherwise adulterated.

Mr. Sclater-Booth.—In reply to the first question, I may say that if the water is added for the preparation of the gin as an article of commerce in a fit state for consumption, the 1st sub-section applies and no offence is committed, and, so far as in the process of distillation a certain amount of water remains mixed with the spirit, the provisions of sub-section 4 would likewise apply in bar of a prosecution. I am aware that recently there have been prosecutions, such as are alluded to in the question. The case of "Pashler v. Stevenitt" came before the Judges of Appeal on the 27th ult. In that case it appeared that the Justices in Petty Sessions held that gin at 44 per cent. below proof could not be considered as gin, and the Judges held that the seller was properly convicted. It appeared that gin sold by retailers varies in strength from proof to 20 per cent. under proof. The Judges held that the question was one for the magistrates, who must use their discretion on the facts before them, and that they had rightly decided that a mixture of water so far as 44 per cent. below proof was a fraudulent increase of the measure of the liquid. A decision reported in to-day's newspapers is to the same effect. In reply to my hon. friend's third question, I cannot but hope that the effect of these decided cases will be to put an end to any uncertainty as to the interpretation of the Act, if such exists, and I am certainly not prepared, as at present advised, to introduce any amending Bill on the subject.

THE ELECTRIC CANDLE.

We recently had the opportunity of witnessing in Paris the working of Jablochkoff's electric candle, under circumstances which were more than usually favorable, to enable a fair judgment to be formed on the matter. The invention is, without doubt, an excellent one, and there seems no question that it will speedily come into use. The idea of wrapping the carbons of the electric lamp in a sheath of asbestos and placing them side by side in a parallel position, insulated only by the asbestos itself, is certainly one of the most novel contrivances which has recently been introduced into electric apparatus. We have good authority for saying that arrangements are being made for its introduction into several large establishments in Paris. Monsieur Breguet of Paris is also, we believe, making arrangements for further tests in England.

PARIS GAS.

The following notes as to the gas supply of Paris will, perhaps, be of interest to some of our readers. The gas was tested in a laboratory close to the Madeleine, on the 22nd, 23rd, and 24th May. Each day it was free from sulphuretted hydrogen; the amount of sulphur in other forms was:—

On the 1st day, 15·6 grains per 100 cubic feet
" 2nd " 15·3 " "
" 3rd " 15·1 " "

On the other side of the Seine, at a place not far from the Luxembourg Gardens, the sulphur, on the average of two days, was 11·5 grains per 100 cubic feet.

G. W. W.

CHEMICAL SOCIETY.

An Extraordinary General Meeting was held on 31st May last, Dr. Gladstone, F.R.S., in the chair. This meeting had been convened in accordance with a requisition signed by some twelve or fifteen Fellows, in order to consider certain measures which were thought to need amendment in the general rules of the Society. Resolutions complaining of the management of the Publication Committee, and of the mode in which Fellows and Associates were elected, and the way in which the Committee are annually elected, were brought forward by Messrs. Kingzett, Paul, Friswell, and others, and in the end the following resolution was passed :—

> "That this meeting thanks the Council for the frank explanations given on the points that have been discussed, and begs to express its confidence in the action of the Council."

The meeting terminated with a vote of thanks to Dr. Gladstone for presiding.

LAW REPORTS.

SULPHUR IN GAS.

House of Commons Committee, May and June, 1877.

The Crystal Palace District Gas Bill.

The Gas Light and Coke Company's Bill.

The object of these two bills was similar, and they were both referred to the same Committee consisting of Mr. Plunket, Chairman, Mr. Foljambe, Mr. Starkey, and Mr. Courtney. Under the Acts at present in force, the 17th section of the Crystal Palace District Gas Act of 1873, provided that the Gas supplied by that Company, should not contain more than 20 grains of sulphur per 100 cubic feet, in any form, and the promoters sought by this bill to be relieved from that condition.

The Gas Light and Coke Company, are at present working under the Act of 1876, by which referees were appointed whose business it was to fix the maximum of sulphur which should be allowed for the different works of the Company, and as was stated by counsel in opening the case, the result was that these referees had prescribed that in the gas made at Beckton, Bow, and Bromley, the maximum amount of sulphur should be 15 grains per 100 cubic feet in summer, and at the other works of the Company 20 grains in summer, and at the works of the Commercial Company 30 grains. The object of this bill as in the other case, was to relieve the Company from any restriction as to sulphur impurity, and as appeared from the opening speech, to enable them to dispense with the use of lime altogether, and exempt them from liability to penalties.

On the part of the Companies Dr. Odling, Dr. Stevenson, Dr. Tidy, and Dr. Russell were called, as well as Mr. Livesy, the Engineer of the South Metropolitan Gas Company, and Mr. George Wilson Stevenson, the Engineer, and the general purport of their evidence was to prove that the character of the products produced by the combustion of the sulphur present in coal gas was not such as to be injurious to health or furniture when the gas was burned in the ordinary way.

At the request of the Committee the three Gas Referees, viz., Professor Tyndall, Dr. Pole, and Mr. Vernon Harcourt were also called and examined, and the latter described in great detail and apparently fully justified the reasons which had induced the referees to fix the sulphur minimum at the point they had done.

On the other side the chemists called were Dr. Frankland, Mr. Charles Heisch, Mr. Keates, Professor Church, Mr. Pattinson, Mr. Falconer King, and Mr. Wigner, and their evidence was to the general effect that the products of combustion of ordinary coal gas did in part consist of sulphuric acid, and that although at first the sulphur in the gas produced sulphurous acid only, yet the moment this latter acid had passed away from the actual zone of ignition in the burner it became oxidised, and converted into free sulphuric acid, and as such, it was destructive to furniture and injurious to health.

After a very short consideration, the Committee declared that the preamble of the Crystal Palace Gas Bill was not proved, and after an adjournment the Committee received some further evidences as to the character of the gas supply in Paris from Messrs. Heisch and Wigner who during the adjournment had been there on purpose to test it. The Committee then declared that the preamble of the Gas Light and Coke Company's Bill was not proved. Both Bills are therefore thrown out.

DISEASED MILK.

Westaway v. Eldridge.

This was an action to recover the sum of £29 9s. 5d., the value of the milk supplied during the month of October, 1876, the plaintiff being Mr. Westaway, a farmer near Staines, and the defendant a retail milk dealer, of Peckham, named Eldridge. For the defence it was contended that the milk so supplied, was diseased and unfit for human consumption and that it had actually produced illness in cases where it had been used. The result of this was that the defendant had been unable to vend the milk and had thrown away large quantities, thereby

incurring beyond the direct loss considerable damage to his trade and reputation, insomuch that after the 12th October he refused to buy of the plaintiff. In course of his evidence the plaintiff called as witnesses to the good quality of the milk his wife and his head cow-keeper. Mr. Allnutt, a veterinary surgeon, stated that after the defendant's refusal to receive the milk he had examined the cows and found them, generally, in a healthy condition; one of the animals had the posterior portion of the udder dried up, and in cross-examination the witness admitted that this might have resulted from previous inflammation. Professor J. A. Wanklyn stated that he received a sample of milk from the plaintiff, and he entrusted its chemical analysis to his assistant. It proved to have a fairly normal amount of fat, solids not fat, and ash. *The milk was therefore, good and genuine.* In cases of diseased milk he frequently found that the preponderance of solids not fat, was too great. *He had examined the milk also, physiologically, i.e., he had administered a dose of it to his assistant, who was in Court, alive and well. Cross-examined by Mr. Willis: He had not used the microscope, as he had no confidence in it for detecting lacteal disease.* The defendant being called described the condition of the milk, which turned bad very quickly. He deposed that he had remonstrated with the plaintiff and had sacrificed the milk. Becoming alarmed, he asked the Public Analyst for Lambeth to examine it. He (Dr. Muter) informed him that the sample was too far gone for analysis, and he therefore supplied him with a fresh sample direct from the rail. In the result Dr. Muter warned him not to continue dealing in the milk, as some of the cows must be diseased. Defendant accordingly returned the milk to the plaintiff, and declined to receive any more. Several customers of Mr. Eldridge were called to substantiate his complaint as to the quality of the milk, and their evidence showed that the fluid was "slimy" and "smelt." Two female witnesses deposed that their infants were seriously affected by a diet of the milk.

Dr. John Muter, Vice-President of the Society of Public Analysts, and Public Analyst for Lambeth, &c., stated that he had received two samples of milk. The first sample being wholly unfit for analysis, he confined his researches to the second, and had observed under the microscope a quantity of pus and casts from the tubes of the milk glands. He decidedly considered the milk unfit for human food, as the presence of pus was a clear indication of inflammatory disease in one or more of the cows. He agreed with Mr. Wanklyn that the milk was good in fatty constituents, and also that it had not been watered; but it was only by aid of the microscope that the evidence of disease such as he had perceived could be detected. For that purpose ordinary chemical analysis was useless.

Cross-examined by Mr. Wright: *No man having experience in the use of the microscope would mistake natural fat globules of milk for pus globules, which happen to be extremely characteristic.*

Mr. D'Arcy Power, F.L.S., said he was assistant to the last witness. He saw the milk under the microscope, and entirely agreed with Dr. Muter as to the presence of pus and the inadequacy of ordinary analysis to deal with such a case.

Mr. Justice Denman, in summing up, reminded the jury that in face of a direct conflict of evidence they must take into account which of the two sets of witnesses were least shaken in their evidence by the cross-examination. In the scientific evidence they had on one side Mr. Wanklyn, whose analysis was made some days after the return of the milk, and *who admitted that he had not used the microscope*, and, on the other hand, they had Dr. Muter, who stated positively that he had noted certain appearances incompatible with healthy milk, and who explained that in such cases *the microscope was a reliable guide.* After reviewing the evidence in a speech which occupied an hour, he left the facts to the consideration of the jury. Without leaving the box, the jury found a verdict for the defendant, and judgment was accordingly given, with costs.

REDUCED SPIRITS.

WEBB, APPELLANT, *v.* KNIGHT, RESPONDENT.

THIS case which was an appeal from a conviction by the Burslem Justices for selling gin adulterated with water, came before Justices Mellor and Lush, on the 13th June. The certificate of the Analyst was that the gin was 43 under proof. The case had been previously before the Court, and had been referred back to the magistrates for a fuller statement as to whether the liquor sold was of the nature, substance and quality of Gin usually sold *at the price in the neighbourhood*, and the magistrate said he could only refer to other cases of a similar character waiting the decision of the High Court. In these cases the following were the prices paid for the gin, and the percentage of water in each case:—Prices paid, 2s. per pint, 29·8 per cent. of water; 1s. 10d., 35·5; 1s. 4d., 32; 1s., 51·10; 2s., 44·10; 1s. 4d., 40·30; and 1s. 8d., 62·28.

After a full argument the conviction was confirmed, Mr. Justice Lush saying that no doubt gin was a compound article, which had in it a mixture of water, but was it of the quality as well as nature of the article purchased. The purchaser could not for the lowest price, expect a purer and stronger spirit. It was a question of degree and of the quantity of water added, and here the magistrate had in fact found that the quantity added was in excess of what could properly be added. The Court could not contradict that finding nor differ from the decision cited. Mr. Justice Mellor's judgment was practically identical.

At Marylebone, John Merry, cheesemonger, was summoned for selling adulterated butter; the analysts' certificate showed adulteration with fat, other than butter fat. The butter was sold wrapped in a paper, which bore the following label: "This compound is warranted sold as imported, and declared according to the Act, section 8," Mr. Greenwell said the parish did not wish to press the case heavily, and would be content with the costs, 4s. 6d., which the defendant was ordered to pay. Thomas Dowding, cheesemonger, was summoned for a similar offence, and fined 10s.

At Lambeth, Joseph Austin, cowkeeper, Old Kent Road, was summoned for selling adulterated milk, on being asked by the inspector for a pint of milk from a particular vessel, the woman serving said, "oh, that's milk and water." He then bought a pint from another vessel on the counter, which was said to contain milk. The analyst certified it to be adulterated with 9 per cent. of water, Mr. Ellison fined him 40s. and costs. In answer to the court, the inspector said it was the practice when officers asked to be served with milk to be met with the reply: "Its milk and water we are selling." Mr. Ellison said if a case with sufficient evidence to convict was brought before him, he would impose the utmost penalty the law allowed.

At Liverpool, R. Elstone, grocer, was summoned for selling preserved peas, colored with a substance injurious to health. The certificate of the analyst was that they contained 2·6 grains of crystallised sulphate of copper per lb. The defendant was fined 20s. and costs. Sarah Warton and Messrs. Brooks and Beck, were summoned for a similar offence, and the same fine was imposed in each case. The case against another defendant was withdrawn, because he proved that directly the peas had been purchased for analysis, he had for his own information, sent a sample to the public analyst, and finding that they were injurious he had withdrawn them from sale.

At Wednesbury, a grocer was summoned for selling adulterated butter. The certificate of the Analyst, Mr. E. W. T. Jones showed that he found 82 per cent. of fat other than butter fat—this was animal fat but was probably wholesome. The defence was that the butter had been purchased from the market as Jersey butter, but it turned out to be butterine. The defendant was fined £5 and £2 13s. 8d. costs.

At Marylebone, William Hopkins, a milk seller, was summoned for refusing to sell milk to Thomas Reeves Clifford, one of the inspectors of Paddington. On the afternoon of the 22nd ult., the inspector saw the defendant in Hall Park selling milk. He went up to him and asked him for a quart out of a can from which a customer had just been supplied. The defendant said that he could not let him have any out of that can, but he could have some out of another can he had on a barrow. The inspector said that he must have some out of the can he had first pointed out. The defendant said that he had not enough in it. The inspector thereupon opened the lid and saw that it contained about three pints, and he told the defendant that he would take as much as he liked to supply him with. He however refused to let the inspector have any of that milk. The inspector told him who he was, and that he would be summoned. These proceedings were taken out under the 17th section of the Food and Drugs Act, and it says that "if any officer, inspector, or constable as described by the Act shall apply to purchase any article of food or any drug exposed to sale, or to sale by retail on any premises or in any shop or stores, who shall tender the price for the quantity which he shall require for the purpose of analysis, not being more than shall be reasonably requisite, and the person exposing the same for sale shall refuse to sell the same to such officer, shall be liable to a penalty not exceeding £10." Mr. Mansfield thought that the summons must fail, as the milk had not been exposed for sale in a shop or stores. Mr. Hortin observed that he relied on the section as far as the comma at "sale," and contended that the other part of the section referred to a different matter altogether. If this prosecution should fail the Act would be comparatively a dead letter. The question was, no doubt, arguable. The case was adjourned in order that the matter might be looked into. Mr. Mansfield now observed that there was a great deal of ambiguity about the section, but there must be a conviction. The defendant would have to pay a fine of 20s. and the costs.

At Westminster, Francis Baker, milk purveyor, of 29, Commercial-road, Pimlico, was summoned for selling milk not of the substance, nature, and quality demanded by the purchaser. It appeared from the evidence that a pint of milk was purchased by the Nuisance Inspector for 2½d., the price of the best milk, and on analysis by Dr. Corfield was found to contain no less than 30 per cent. of added water. The defence was that the boy who sold it had mistaken the bowl, and had served "skim milk" instead of the best article. The defendant was fined 10s. and 12s. costs.

At Clerkenwell Police Court, a baker was summoned for selling bread adulterated with alum. Dr. Stevenson's certificate was, that it contained 35 grs. of alum per 4lb. loaf, which in his opinion was injurious to health. The defendant's foreman admitted in cross examination that alum was known in a bakery as "the doctor," and that it would give inferior flour the appearance of the "best wheaten;" the defendant was fined 20s. and costs, and a second summons for a similar offence on another day was allowed to be withdrawn on payment of £2 4s. costs.

At Coventry, a farmer was recently summoned for selling milk, from which cream to the amount of one-fourth had been abstracted by skimming. The analysis of Dr. Horace Swete, Public Analyst, showed that it contained 2·22 per cent. of fat, and he stated that the lowest quantity in good milk was 3·2. The defendant and his son and salesmen were examined, and declared that the milk had not been tampered with from the time it was milked to the time it was sold. The bench dismissed the case and allowed the defendant's costs.

OBITUARY.

Our readers will regret to see the announcement of the death of Mr. J. J. Griffin, F.C.S., who has been in business for many years as head of the firm of Griffin and Sons, of Garrick-street, Covent Garden. His name appears among the original members of the Chemical Society when it was founded in 1841. He made a considerable number of improvements in different kinds of chemical apparatus, and there is no question that the catalogue of scientific apparatus issued by his firm under the name of "Chemical Handicraft," has been of great assistance to many chemists in selecting apparatus suitable for special researches.

CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

To the Editor of "The Analyst."

Sir,—Nearly one-half of the prosecutions under the sale of Food and Drugs Act are prosecutions for the sale of adulterated milk, I think, therefore, that it is scarcely possible for us to give too much attention to such an important subject.

In your last number you reprinted several reports of Analysts, and most of them refer in a special manner to milk; you also published a letter from Mr. Carter Bell, referring to milk analysis, not only in a general way, but with special reference to a certificate which is said to have been given by an Analyst, who certainly ought to have been one of the first to uphold the results which are obtained by the present process of milk analysis.

Every Analyst should make it a point of duty to examine the ash of every sample of milk he receives before he gives a certificate of adulteration, and I have no hesitation in saying that no Analyst would be justified, under any circumstances, in giving a certificate of adulteration, unless he had ascertained the percentage of ash which the sample of milk contained, and had also carefully estimated the chlorine present in that ash, and, supposing that the results so far were abnormal, had qualitatively tested the ash in order to find whether any adulterating ingredient had been added.

I will, however, go still further, and say that it is the duty of the Analyst in every case where a milk shows any suspicious signs, to examine the sample carefully under the microscope. Chemical examination, so far as it goes, is valuable and accurate, and there is no doubt that it does determine the amount of dilution with water, within a very small percentage when calculated on the poorest milk, but there is also no doubt that when the milk has come from a diseased cow, the chemical results *give no clue whatever* to the diseased state of the milk, and therefore no guide to the injury which may be caused by its use. The milk of a cow suffering from foot and mouth disease, which frequently attacks the udder, will show little, if any, deviation from the ordinary chemical standards, *i.e.*, it may still give 9 per cent., or even 9·3 per cent. of solids not fat, and the proportion of fat may be normal, or even in some cases excessive, but yet the milk may be in such a state of disease that its use as food would not only be unpleasant, but attended with probable danger to health.

The Government fully recognized the importance of this fact when they specified that Public Analysts should be possessed of competent *microscopical* knowledge, and I contend that unless an Analyst is competent to examine a sample of food microscopically, as well as chemically, he is not justified in holding a position under the Sale of Food and Drugs Act, where he may be called upon not only to certify whether a sample of milk is adulterated with water, but also, as the Act itself states, whether it it of "the nature, substance, and quality demanded." When a customer asks a milkman for milk, he certainly asks by inference, if not in so many words, for the milk of a healthy cow, and if he is supplied with milk from a diseased cow, the law is certainly infringed. Chemical analysis is quite insufficient to detect this infringement, although it is far more dangerous to the customer than mere adulteration with water. A microscopical examination is therefore absolutely essential.

I have known of cases in which diseased milk has been sold in London, not only to inspectors, but distributed through an entire district, and it is quite impossible to ascertain how much the weekly rate of mortality has been raised by such rascality—I know not what other name to give it.

Yours &c.,
PUBLIC ANALYST.

NOTES OF THE MONTH.

The prize of 300 marks offered by the *Leipsig Pharmaceutical News* for the discovery of a process of butter analysis, still continues to crop up in various journals, no doubt through the active scissors and paste of the sub-editors. Not the least amusing of these paragraphs is one which winds up with a moral reflection to the effect that our own Chemical Society would be better employed in offering such rewards for useful processes of

analysis, than in subsidising those who entirely direct their attention to the discovery of organic compounds with unpronounceable names. No doubt this is to some extent true, as it is a fact that, at Burlington House, the manufacturer of some rare organic salt certainly holds his head higher (at least in his own estimation) than the humble originator of some process of analysis useful for the guidance of men engaged in commerce, but, unfortunately, the *good* moral is attached to a *bad* illustration. We would suggest that Herr Kohlmann, of Leipsig, should save his 300 marks by investing ten of them in the purchase of back numbers of "*The Analyst*," and therefrom inform his mind on butter analysis.

While on the subject of abstruse organic research *versus* improvements on practical analysis, we may note that the former has many advantages, of which two are especially prominent, viz.:—(1) It may secure an invitation to the debates of the selected few who are going (if they can) to proclaim themselves, and those whom they may choose, the only competent analysts in Great Britain, and (2) It has the grand advantage that a man may say pretty well what he likes, as it is most likely that no one will take the trouble of repeating his experiments!

An awful whisper is going round the laboratories to the effect that the gentlemen who have been privately attempting to form themselves into a proposed Institute of *Professional* Chemists (taking care to keep the power of selection in their own hands, by inviting no one they did not like), are meeting with a most determined opposition, and have already been obliged to drop the word *Professional*, and become simply an "Institute of Chemistry." As the select nucleus contains Pharmaceutical and manufacturing, as well as analytical chemists and *dilettanti*, the *raison d'etre* of the whole affair evidently becomes dissipated into misty air. Have we not already a "Chemical Society," admitting every class of persons interested; and, if so, what need is there for an "Institute of Chemists," also receiving Pharmacists and manufacturers? Such a society could scarcely expect to obtain from Government the power to dub analysts competent or not, as they please, and we should fancy that the analysts in practice throughout England would think twice before they permitted their qualifications, and consequent existence, to be submitted to the pleasure of a body of men who have given no public invitation to their meetings, and who are not all themselves even, strictly, chemists.

In pleasant contrast to the hole and corner work of attempted private organisation, stands out the Society of Public Analysts, to which the ground of admission is, that the candidate for membership shall be an analytical chemist in actual practice, known to a certain number of his *confrères*, who can vouch for his knowledge of his professional duties; and that the associates shall be the actual assistants of analysts in practice who may be recommended by the Council. Here is a society with a definite object, strictly and properly limited to actual practising analysts, and therefore entitled to insist on the recognition by the public of the competence of its members, who one and all live by their profession. If, as we shortly hope will be the case, the word "public" be definitely dropped from the title, the Society will be in theory, as it is now in fact, an organisation of purely professional chemists, which no amount of opposition or backbiting has been able to shake, and which will eventually become the true nucleus of the more extended scheme of future examinations or such similar tests of competence as may be adopted. We now possess as members most of the practising analysts in England; let the remaining few come forward and join us, and organisation will at once be *un fait accompli*.

We abstract from the Coventry local paper the report of a milk case. Prosecutions of tradesmen on such results as those reported by our Coventry contemporary are to be much deplored, but they are not to be wondered at, when local Boards go on appointing Medical Officers of Health as Public Analysts, instead of selecting men trained to the profession of practical chemistry by a long course of laboratory work as student, assistant, and afterwards master.

The *Lancet* of 16th June, incidentally refers to a subject which bears a certain relation to this matter. It says, in reviewing the Handy Book of Forensic Medicine by Drs. Tidy and Woodman. "It is certainly not to be expected of the ordinary medical "man, that he should be able to carry out the details of the most difficult of all analyses,

"and it is certainly most unfair to the accused that he should attempt to do so." We agree with our contemporary as regards many analyses, besides poison cases, although we have known *ordinary* medical men undertake even them.

In a recent note to the Berlin Chemical Society, Herr Stein proposes to make the beams, &c., of the balance of the future from rock crystal. The idea is certainly novel, and the lightness and unalterable nature of the substance, appears to recommend it, but how about the cost, seeing that the difficulty of working the crystal must be immense? We should like to know more also about its flexibility.

We reprint an important case of diseased milk, but, under the circumstances, we must refrain from remarks, simply leaving the evidence to speak for itself.

Before our next issue the question as to the permissibility of putting copper into preserved peas will have been settled by a rehearing, on appeal, of a case in which the magistrate convicted. We understand that many of the leading members of our Society and several eminent medical men will give their evidence as to the danger of permitting the sale of vegetables artificially coloured with copper. It will be interesting to note who will respond to the call of the defence, and come forward and swear that copper administered daily is not only quite innocent, but an excellent tonic. We hear that there is one gentleman who has given his opinion to that effect. Suppose he were to begin now, and try it for a few weeks on himself; but then he would, of course, object that theory is one thing and practice another!

RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Southampton Row, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
3552	R. Applegarth	Electric Light	4d.
3830	F. Tomasi	Hydrothermic motive power engine	8d.
3885	T. L. Parker	Treating Tobacco	2d.
3914	H. C. Ahrbecker	Fluid Meters	6d.
3946	A. E. A. Detiaque	Italian Paste Covers for Enclosing Medicinal Substances	6d.
4006	N. B. Downing & J. E. Hughes	Evaporating Alkaline Solutions	6d.
4015	E. Reynolds	Centrifugals, Pumps, and Fans	8d.
4052	W. A. Carter	Incinerating Furnaces	6d.
4075	G. Fahnehjelm	Explosive Compound	4d.
4085	J. C. H. Sievier	Manufacture of Gas	4d.
4111	J. H. Johnson	Sugar	6d.
4112	Ditto	Treating Animal and Vegetable Substances with Hydro-Carbons	6d.
4204	G. D. Mease	Furnaces for Decomposing Chlorides of Sodium and Potassium, Manufacturing Alkalies, &c.	6d.
4269	G. Schaub	Electro-Magnetic Engines...	6d.
4295	T. Shaw and J. Heap	Annealing Pans	4d.
4301	J. H. Johnson	Refining Saccharine and other Liquids	2d.
4312	A. M. Clark	Electric-Light Buoy	6d.
4362	R. Powell and W. Atkins ...	Manufacture of Hyposulphate of Soda	6d.
4418	G. W. Von Nawrocki	Apparatus for Manufacture of Concentrated Sulphuric Acid, &c.	4d.
4426	C. Rosway and H. Geary ...	Treatment of Impure Lead	4d.
4433	A. M. Clark	Decolorising and Purifying Saccharine Juices	4d.
4516	C. D. Abel	Purifying Sewage and other Foul Waters	2d.
4573	C. Rands...	Treatment of Vegetable Substances to obtain Alcoholic Liquids	2d.
4577	W. R. Lake	Salts and Soaps for Preparation of Fabrics	4d.
4586	H. M. Whitehead	Preserving Meat	2d.
4624	J. Harvey	Preserving Meat, Fish, &c.	4d.
4912	W. V. Wilson and H. Cant ...	Aniline Dyes	2d.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The American Chemist; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Telegraphic Review; The Medical Record; The Geological Society's Proceedings; The Miller; The Anti-Adulteration Review

THE ANALYST.

ON THE ESTIMATION OF OLEINE, &c., IN FATS,

By Dr. Muter, F.C.S.

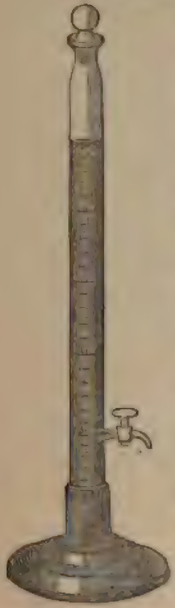
It is a principle well-established and laid down in most works on chemistry, that oleine may be separated from stearine and palmatine by taking advantage of the solubility of oleate of lead in ether, but the best methods of carrying out the separation are not as a rule given. I believe that the ordinary idea is to saponify with oxide of lead and water, dissolve in ether, remove the lead by sulphuretted hydrogen, and weigh the oleic acid, but in practice this is a very undesirable method. A much better way is to follow somewhat closely a commercial process, known in Holland, of separating the oleic acid from the lead by hydrochloric acid in the presence of ether, but there are several important precautions necessary to be attended to so that accurate results may be obtained. In the course of my experience in the analysis of fats, I have noticed several points, and I propose to give them in as short a form as possible, together with a detail of what I have found to be the most simple and accurate processes.

The first important matter is to ensure the formation of a *perfectly neutral* plumbic oleate, $Pb\ 2\ C_{18},\ H_{33},\ O_2$, as the slightest quantity of basic oleate will render the analysis inaccurate, owing to its much less degree of solubility in ether. To attempt this by the ordinary method of saponification with plumbic oxide is quite hopeless, but it may be readily attained as follows:—A small quantity (not more than 1·5 grammes) of the fat is saponified by alcoholic potash and then well diluted with boiling water. The solution is carefully treated with acetic acid till feebly acid, and then worked back with dilute potash till just neutral. This can be done without the use of test paper, by adding the acid to the soap solution, at the boiling point, until a decided *permanent* turbidity is produced, and then dropping in the potash with *constant stirring*, until the liquid *just clears again*. The clear solution is then precipitated by plumbic acetate in slight excess, and stirred until the precipitated soap settles thoroughly. The supernatant liquor is poured off, and the soap once washed by boiling with a large volume of water and decanting. By this process we obtain the perfectly neutral lead salts, containing:—

$Pb\ 2,\ C_{18},\ H_{33},\ O_2$	... ...	Plumbic Oleate.
$Pb\ 2,\ C_{16},\ H_{31},\ O_2$	... ...	Plumbic Palmitate.
$Pb\ 2,\ C_{18},\ H_{35},\ O_2$	... ...	Plumbic Stearate.

The first being readily soluble in ether, and the two latter quite insoluble. The soap is scraped from the basin with a platinum spatula and transferred to a flask of 100 c.c. capacity. The basin is rinsed into the flask with absolute ether, and then the flask is filled up with the same solvent, corked, shaken at intervals for some hours, and finally set to subside. The whole is then filtered through white filter paper, and the precipitate washed with ether till the washings cease to blacken with ammonium hydrosulphide. The filtrate and washings (which should not exceed 200 c.c.) contain the plumbic oleate, whilst the palmitate and stearate remain on the filter.

I have proved by many experiments that the solution really does contain pure plumbic oleate, of which I will, however, only notice the one in which I got the greatest divergence from theory; 40 c.c. of the ether solution evaporated yielded 1·162 of residue; another 40 c.c. were then shaken up with hydrochloric acid, mixed with alcohol, and the plumbic chloride formed collected, dried, and weighed on a tared filter. The weight of $Pb\,Cl_2 = \cdot424$, equal to ·340 Cl_2 plumbic oxide, thus showing 29 26 per cent. of oxide of lead—theory requiring 29 per cent.



Having thus got a solution of the pure neutral lead soap in ether, it is transferred to a long graduated tube of 250 c.c., graduated from the bottom upwards, and furnished with a well ground stopper and a stop-cock, which is placed at 50 c.c. from the bottom.* About 20 c.c. of a mixture of one part hydrochloric acid and two parts water is then added, the tube is stoppered, well shaken, and set to subside, when a clear solution of oleic acid remains, the plumbic chloride sinking to the bottom. When sufficiently settled, a fixed portion of the ethereal solution is run off through the stopcock into a tared platinum dish, evaporated and dried at 212°, and the oleic acid is weighed and calculated to the whole bulk. To make sure, it is well to run off two different quantities and weigh them, so checking the one by the other.†

If it is desired to estimate the stearic and palmitic acids together, the residue should be filtered and the soap remaining on the filter detached and heated for some time (with constant stirring) with dilute hydrochloric acid, which will liberate the acids so that they may be collected and weighed in the usual manner. The filter paper is also to be burned and the ash treated with a drop or two of sulphuric acid, and any lead remaining on the paper weighed as sulphate, 303 parts $Pb\,S\,O_4$ equalling 568 parts stearic acid.

For those who may not wish to go to the expense of the special tubes, and who do not grudge a little extra trouble, the oleic acid may be estimated in the ethereal solution of plumbic oleate, by simply making it up to a known bulk and taking a fixed portion in a tared platinum dish. This may then be evaporated, dried at 212, and the plumbic oleate weighed. To ensure absolute accuracy, however, (lest by imperfect manipulation any trace of basic oleate be present) it is necessary, in this case, to ignite the weighed residue, and again weigh as $Pb + Pb\,O$. This residue is treated with acetic acid to take up the $Pb\,O$, and again weighed, and the residual Pb calculated to $Pb\,O$. By deducting the weight of plumbic oxide thus obtained from the total plumbic oleate, and allowing for the hydrogen displaced, we get the oleic acid.

I prefer, of course, in all cases to use the tubes, as with them the process is much more rapid and fairly accurate. I give the following selected analysis as showing the extreme divergences from truth that I have obtained at various times.

A sample of butter, yielding 88·5 insoluble acids gave—

Oleic Acid	40·4
Stearic and Palmitic Acids	47·5
	87·9 total.

* These tubes are especially made for me by Messrs. Jackson, Barbican, E.C., and can be obtained from them.

† The more fluid drawn off for each weighing of course the less the possible error.

Another sample of butter, yielding 87·1 insoluble acids gave—

Oleic Acid	34·8
Stearic and Palmitic Acids...	52·1
	86·9 total.

A sample of lard, yielding 95 per cent. insoluble acids gave—

Oleic Acid	47·5
Stearic and Palmitic Acids...	47·4
	94·9 total.

Two different experiments for oleic acid only in the same sample of fats—

1st experiment.	2nd experiment.
43·2	43·8
46·8	46·6
52·7	53·0
48·0	49·0

The worst experiment was done at an early stage of the investigation and represents an amount of error not likely to occur after practice.

I am now engaged in applying the process to the analysis of lard, in the hope of establishing a standard for calculating its adulteration by other fats, but as yet I fear its relative proportions of fatty acids are too variable for much success in this direction.

ANALYSIS OF A SAMPLE OF PORT WINE RECOVERED FROM THE "ROYAL GEORGE."

By A. Dupré, Ph.D. F.R.S., &c.

The interest excited by the recent publication of an analysis of a sample of very ancient wine by M. Berthelot, leads me to believe that the following may not prove uninteresting to many. In the summer of last year, I received from Dr. Seaton, F.R.S. a small sample of port wine with the following history attached—the bottle from which the sample was taken was originally on board the "Royal George," and went down with that vessel on 29th August, 1782, and when the ship was raised this bottle was recovered from it. The bottle next passed into the hands of Dr. Seaton's father, and thence into the possession of Dr. Seaton, and was opened on July 1st, 1876. It was only partially filled when it passed into Dr. Seaton's hands, and was not quite half full when opened on July 1st. It had not, so far as is known, been recorked after it was raised. The wine was very turbid, had a disagreeable salty taste, and a somewhat unpleasant smell, scarcely reminding one of wine. The sample I received had been filtered; it was clear, of pale amber colour, and very little vinous smell. I had so little that I did not taste it. The analysis, so far as it could be made with so small a quantity, gave the following results:—

Specific gravity	1003.8
Alcoholic strength	6.05 per cent. by weight in volume
Total free acid calculated as tartaric acid ...	0·45
" fixed acid " " ...	0.165
" volatile acid " acetic " ...	0·228
" dry residue	3.98 per cent.
Containing mineral matters	0.78 "
" organic "	3.20 "
Amount of Chlorine in wine	0.29 "
= Chloride of Sodium	0.478 "
Sugar	0.64 "

Some of the more striking points of this analysis are the facts that so much of vinous quality has been retained; next, that so much alcohol has disappeared, and yet so little acetic acid has been formed; and, lastly, that so little sea water has found its way into the bottle. Even when taking all the chlorine as derived from sea water it shows an admixture of only about 15 per cent. The alcohol, therefore, cannot have been lost by diffusion while the bottle was submerged, otherwise much more sea water would have got in. The amount of sugar still left, more than half per cent, is also remarkable.

ON THE EXAMINATION OF HOPS.

By W. E. Porter, F.C.S., &c.

Lately I have been trying some experiments with the following method for estimating the essential part of hops, viz., the oil, resin, and bitter principle. I believe the results to be pretty accurate, and to give their value according to the percentage that they yield.

The apparatus I use consists of a modification which I have made of the apparatus figured on page 195 of Church's Laboratory Guide. In this apparatus I extract the oil, resin, and bitter principle from the hops by means of ether vapour, taking care to let the ether boil among the hops.

Hops, after being subjected to this process and dried, are quite tasteless, and if treated with hot alcohol and afterwards with water, yield only tannin* and gummy extractive matter, showing that the oil, resin, and bitter principle have been taken up by the ether.

I weigh the hops in preference to letting the ether evaporate, as I find the percentage is higher from the evaporated extract, owing, I believe, to the oxidation of the oleo-resin by the air, in fact the Saatz hops gave 22.40 as loss from moisture, oleo-resin, &c., but by allowing the ether to evaporate they gave nearly 3 per cent. more as residue.

The following results were given by hops grown in different localities and of varied qualities. Nos. 1, 2, 3, 4, and 5 were of the finest quality, 6 and 7 medium, and 8 and 9 low. No. 1 were the Saatz, and considered to be the finest that are grown; these are sun-dried hops, No. 2, Worcester, dried by patent kilns; 3, 4, and 5, Kents; 6, Sussex; 7, Kents; 8 and 9, Sussex.

No. 1.—SAATZ.

Moisture	4.75
Oil, Resin, and Bitter principle	17.65

No. 2.—WORCESTER F.

Moisture	4.95
Oil, Resin, &c.	15.55

No. 3.—KENTS F.

Moisture	5.50
Oil, Resin, &c.	14.45

No. 4.—KENTS F.

Moisture	4.90
Oil, Resin, &c.	13.60

* Tannin is insoluble in pure ether.

No. 5.—KENTS F.

Moisture	5.60
Oil, Resin, &c.	14.87

No. 6.—SUSSEX M.

Moisture	5.12
Oil, Resin, &c.	12.13

No. 7.—KENTS M.

Moisture	5.82
Oil, Resin, &c.	11.30

No. 8.—SUSSEX L.

Moisture	4.20
Oil, Resin, &c.	9.15

No. 9.—SUSSEX L.

Moisture	5.10
Oil, Resin, &c.	9.90

All these hops were grown in 1876, and nine months have elapsed since they were bagged. No doubt fresh hops contain a much larger quantity of oil, which is said to reach about 8 per cent. when new, *but in time most of this oil becomes converted into resin,* which for brewing purposes is probably the best, as the oil must have a tendency to render beers turbid. I do not think the oil in old hops is as high as 2 per cent.

There is a great difficulty in separating the oil from the resin, for I find upon trying to do so the greater part becomes *converted*. What little oil I have separated has an odour like penny royal, but when rubbed on the hands gives the fine aroma of the hop. If left exposed to the air for some time it becomes resinous, and has a valerianic smell.

By treating the fresh resin with boiling water, and filtering, the solution has a strong bitter taste, with a true hop flavour.

I append the following extract from "Beer and Brewing," by Dr. Jules Morel, in the *Brewer's Journal*, June 15th, 1877, which has just been sent to me:—

"For a long time hop oil was considered as containing strongly the aroma which characterises beer, and essences of hop oil (solution of hop oil) have even been sold in commerce to be added to beer in order to increase its aroma. Fortunately this idea was abandoned, as the essence communicated a particular medicinal odour to the beer, which is explained by the hop oil being transformed into valerianic acid. The only importance possessed by hop oil in the preservation of hops is that it preserves the resin with which it finds itself in contact. In fact, resin is modified by the air in such a manner as to become insoluble in the usual solvents. This conversion is hindered as long as the resin remains in contact with the oil. The oil may even, in old hops, be converted in great part into valerianic acid without the resin losing its property of dissolving.

There exists some very erroneous ideas among brewers concerning the part which the essential oil of hops plays in the manufacture of beer, therefore we cannot too often repeat that *the resin indicates the value of the hops*, because it is the resin which imparts the bitter flavour that dissolves in the saccharine liquid; this is again separated by the fermentation, and forms like a varnish round the cells of the ferment in such a manner as to abate fermentation."

GOVERNMENT VOTES IN AID OF SCIENTIFIC RESEARCH.

The following list will be read with interest if not with satisfaction. The grants are made on the recommendation of the Royal Society.

Personal Payments.

Mr. J. A. Broun,—For Correcting of the Errors in the published Observations of the Colonial Magnetic Observatories, £150.

Dr. Joule.—For Experimental Investigations into the Mechanical Equivalent of Heat, £200.

Prof. Parker.—For Assistance in Researches on the Morphology of the Vertebrate Skeleton and Relations of the Nervous to the Skeletal Structure, chiefly in the Head, £300.

Rev. W. H. Dallinger.—For Microscopic Investigations of Monads, Bacteria, and other low forms of life, £100.

Rev. F. J. Blake.—For compiling and publishing a "Synopsis of the British Fossil Cephalopoda," £100.

Prof. A. H. Garrod.—For Aid in preparing for Publication an Exhaustive Treatise on the Anatomy of Birds, £100.

Dr. Murie.—For completing and publishing three Memoirs:—"Anatomy of the Kingfisher," 4to., with five plates; on "Extinct Sirenia," 4to., with six plates; "Osteology of the Birds of Paradise," folio, three plates, £150.

Mr. H. Woodward.—For continuation of Work on the Fossil Crustacea, especially with reference to the Trilobita and other Extinct Forms, and their Publication in the Volumes of the Palæontographical Society, £100.

Prof. Schorlemmer.—For Continuation of Researches into (1) the Normal Paraffins, (2) Suberone, (3) Aurin, £200.

Dr. H E. Armstrong.—For Continuation of Researches into the Phenol Series, and into the Effect of of Nitric Acid on Metals, £300.

Profs. King and Rowney.—For Researches to determine the Structural, Chemical, and Mineralogical Characters of a certain Group of Crystalline Rocks represented by Ophite, £60.

Mr. W. J. Harrison.—Towards the Expense of collecting and describing Specimens of the Rocks of Charnwood Forest, £50.

Non-Personal Payments.

In aid of Apparatus, Materials, and Assistance.

Dr. J. Kerr.—For Aid in Electro-Optic and Magneto-Optic Researches, £200.

Mr. J. E. H. Gordon.—For Experimental Measurements of the Specific Inductive Capacity of Dielectrics, £50.

Prof. Guthrie.—For Apparatus and Assistance in (1) the Determination of the Latent Heats of the Cryohydrates and the Vapour Tensions of Colloids; and (2) the Examination of Heat Spectra and Radiant Heat by means of varying Electrical Resistance in Thin Wires, £150.

Mr. J. T. Bottomley.—To aid in carrying out a Series of Experiments for Determining the Conductivity for Heat of Various Liquids and Solutions of Salts, £100.

Sir William Thomson.—For Assistance and Materials for a Continuation of Experiments on the Effects of Stress in Magnetism, £100.

Mr. W. Crookes.—For Assistance in continuing his Researches connected with "Repulsion resulting from Radiation," £300.

Messrs. Rücker and Thorpe.—For a Comparison of the Air and Mercurial Thermometers, £50.

Mr. F. D. Brown—For an Investigation of the Physical Properties, the Specific Gravity, Expansion by Heat and Vapour Tension, of the Homologous and Isomeric Liquids of the $C^n H_{2n}$ Series, £100.

Prof. Roscoe.—For Continuation and Extension of the Experiments on the Self-Registering Method of Measuring the Chemical Action of Light, £100.

Sir William Thomson.—For Investigation and Analysis of Tidal Observations and Periodic Changes of Sea Level, £200.

Dr. J. B. Balfour.—For the expense of Illustrations for a "Monograph of the Pandanaceæ," £50.

Mr. H. T. Stainton—For Aid in publishing the "Zoological Record," £100.

Dr. J. G. M'Kendrick.—For Apparatus for a Research into the Respiration of Fishes, £75.

Prof. Gamgee.—For a more complete Survey than has yet been made of the Physiological Action of the Chemical Elements and their more Simple Compounds, with the Object, in the first instance, of establishing a Physiological Classification of the Elementary Bodies, £50.

Dr. Brunton.—For Researches into the Physiological Action of the most important Compounds of *Nitrogen*, and into the Action of certain Poisons, and for Apparatus, £80.

Mr. E. Schäfer.—To pay the Wages of an Assistant to give Mechanical Aid in Histological and Embryological Research, £50.

Dr. Burdon Sanderson.—For an Investigation of the Normal Relation between the Activity of the Heat producing Processes and the Temperature of the Body, £70.

Prof. Schorlemmer.—For Continuation of Researches, into (1) the Normal Paraffins, (2) Suberone, (3) Aurin, £100.

Mr. W. N. Hartley.—For Researches into the Photographic Spectra of Organic Substances, into the Phosphates of Cerium, the Conditions under which Liquid Carbonic Acid is found in Rocks and Minerals, the Double Salts of Cobalt and Nickel, and for other Investigations, and for Assistance, £100.

Dr. Burghardt.—For a Research into the Origin of the Ores of Copper and (if possible) of Lead, their Mode of Formation, and the Chemical Connection (if any) between the Ore and its Matrix, £50.

Prof. Church.—For a Research into the Colouring Matters of Colein, of Red Beet, and for the Study of Plant Chemistry, £50.

DETERMINATION OF GLUCOSE IN BLOOD AND OTHER ORGANIC SUBSTANCES.

Dr. Pavy, F.R.S., recently read a paper before the Royal Society on a modification of the methods previously in use for the quantitative determination of glucose in animal substances. There is no doubt that where minute traces of glucose are in question, Dr. Pavy's method introduces improvements which must greatly conduce to the delicacy of such process, and although it can scarcely be considered as practicable in commercial analyses because of the time involved, it must necessarily form a material advance in our methods of procedure where delicate investigations are concerned. The process consists essentially in an adaptation of the old gravimetric process of determination by means of a solution of sulphate of copper and double tartrate of soda and potash, the liquor being, however, in the first instance mixed with an excess of solution of sulphate of soda and boiled, so as to coagulate it. The liquid is then filtered, and the potassio tartrate of copper added to the filtrate. The reduced sub-oxide of copper is then separated by filtration from the liquid, dissolved in a few drops of nitric acid, with a small quantity of per-oxide of hydrogen added to effect oxidation, and the amount of copper present in the precipitate, instead of being estimated as in the old process by direct weighing of the sub-oxide involving the necessary errors due to the presence of the filter ash and to other circumstances, is determined by galvanic deposition of the copper upon the surface of a piece of platinum foil or wire, which is weighed before and after the galvanic action. The results are calculated out according to the old formula, viz., that 1 part of copper equals ·5678 of glucose. The author of the paper rightly states, "This application of the copper test solution yields a gravimetric process of analysis instead of a volumetric, and one which has no uncertainty belonging to it. There is nothing for the mind to do, and no opportunity for error of judgment."

Dr. Pavy subsequently read a second paper on this subject before the Royal Society. It is the issue of the application of the above process.

Dr. Pavy dealt with the question of the quantity of sugar in the system under the following conditions:—

1. The amount which exists in blood in its normal condition.
2. The comparative state of arterial and venous blood.
3. The spontaneous change which takes place in blood after its removal from the system.

The author pointed out that the very rapid changes which take place in blood under altered conditions of the system render it essentially necessary that the greatest

precaution should be observed in order to obtain blood in its natural condition. If taken during life the animal should be in a perfectly tranquil state. If after, it should be procured as instantaneously as possible after the death of the animal, so that no opportunity could be afforded for the blood to be affected by the *post mortem* production of sugar in the liver.

The experiments now under notice were made on dogs, sheep, and bullocks' blood, and a series of six, in one case seven, examinations of each kind instituted, and two analyses made for every sample taken.

In quoting Dr. Pavy's figures we are giving the mean of the two separate analyses. It is necessary, however, to state that the extremes of each show but trifling variations, and these are rarely so great as to affect more than the second figure in decimals.

The mean results of seven examinations of dogs' blood showed the amount of sugar which it contained in parts per 1,000, to be as follows:—0.751, 0.786, 0.700, 0.766, 0.786, 0.921, 0.803 respectively. This gives an average of 0.787 on the whole series.

The blood of sheep yielded 0.470, 0.490, 0.517, 0.559, 0.569, 0.526, respectively, or an average of 0.521 parts of sugar per 1,000.

The bullock's blood gave 0.703, 0.525, 0.492, 0.456, 6.499, 0.588, or an average of 0.543.

In each of these experiments every care was taken to secure the blood in such a manner that it was a reliable representation of its ordinary condition during life. Unless such precautions are taken the results obtained will be, in a physiological point of view, worthless and misleading.

This fact was strikingly illustrated by a comparison of results which Dr. Pavy obtained from four bullocks killed in the ordinary way, viz., by felling the animal with a poleaxe, and breaking up the spinal cord by means of a cane. In the first two of these observations the opening into the blood vessels was made as speedily as possible after the animal had been felled. In the next two Dr. Pavy had reason to believe that this necessary condition had not been complied with, and that some little time was allowed to elapse between the felling of the bullock and the opening of the vessels. The effect of this delay in the *post mortem* production of sugar is shown by the following results:—

Blood of the first two bullocks (mean of two analyses) yielded 0.596, 0.688, parts of sugar per 1,000, respectively. In the second two a mean of 1.053 and 1.094 parts of sugar per 1,000 were given.

The conclusions to be drawn from these various experiments are, that the amount of sugar contained in the blood of sheep and bullocks is about ½ per 1,000 or 1 in 2,000, and in a dog about ¾ per 1,000, or 1½ per 2,000. Taking the results of the whole series of observations they show a remarkable uniformity and harmony in the amount of sugar contained in the blood of the respective animals.

COMPARATIVE STATE OF VENOUS AND ARTERIAL BLOOD.

The author next considered the comparative states of the arterial and venous blood. This part of the subject is one which possesses the greatest importance from a physiological point of view.

One of the effects of anæsthetics on animals is to occasion an abnormal amount of sugar in the blood, in order to attain accuracy, therefore it is indispensable that blood should be taken at a time when the animal is not under such influence.

In the first observation made on the blood of a dog, life had been instantaneously destroyed by pithing, and collections were made immediately after from the jugular vein and crural artery. No time was allowed for the effect of *post mortem* formation of sugar in the liver to influence the blood. The results obtained by this method were as follow: crural artery, ·799, ·791; *mean*, ·795. Jugular vein, ·793, ·791; *mean*, ·792 In order, however, to obtain evidence to which no exception could be taken, Dr. Pavy adopted another method of procedure, which he was enabled to do just prior to the meeting of the society, from having a restriction previously imposed under the Vivisection Act removed. This enabled him to collect the blood under the natural conditions of life, both from the carotid artery and the jugular vein. The animals operated upon were placed under an anæsthetic, during which time the vessels were exposed and a thread placed loosely round each. After they had regained tranquility, and the effect of the anæsthetic passed off, the vessels were drawn forward and openings made into them to allow of the simultaneous escape of blood. So quietly and painlessly was this operation of collection performed, that the animals themselves manifested no signs of consciousness of what was taking place. The analyses of the blood obtained in this manner were commenced before coagulation had time to occur, and the results were as follow: No. 1, carotid artery, ·806, ·817; *mean*, ·811. Jugular vein, ·803, ·788; *mean*, 798. No. 2, carotid artery, ·854, ·873; *mean*, ·863. Jugular vein, 863, 896; *mean* ·879.

From these figures it is clearly evident that no material difference exists in the amount of sugar contained in arterial and venous blood.

SPONTANEOUS DISAPPEARANCE OF SUGAR FROM BLOOD.

Turning to the third part of his subject, viz., the spontaneous disappearance of sugar from blood after its removal from the system, Dr. Pavy gave the results of a series of analyses he had conducted, and which are as follows:—

No. 1.	Taken immediately after death	mean	·786
	„ after 1 hour	„	·739
No. 2.	Taken immediately after death	„	·700
	„ after 1 hour	„	·670
No. 3.	Taken immediately after death	„	·766
	„ after 1 hour	„	·751
	„ „ 23 hours	„	·285
No. 4.	Taken immediately after death	„	·786
	„ after 1 hour	„	·728
	„ „ 24 hours	„	·302
No. 5.	Taken immediately after death	„	·921
	„ after 1¾ hours	„	·793

Dr. Pavy pointed our that there was nothing new in the suggested discovery that a gradual destruction of sugar takes place with blood after its removal from the system. He himself had brought the fact before the notice of the Royal Society so far back as 1855, when he stated that under the changes of the decomposition of blood normal animal glucose is very readily metamorphosed. The rapidity of the metamorphosis depending on the activity of the decomposition of the animal substances present.

In conclusion the author stated that the evidence adduced in this communication shows that the results which Bernard has obtained by the experimental *modus operandi* he has been recently employing are erroneous, and, consequently, the inferences he has drawn from them are equally in error. The cause of truth and the interests of science demand that what he has recently been advancing should be eliminated from physiological literature.

MILK ADULTERATION IN NEW YORK.

The *New York World* has given a list of more than 150 milk dealers who have been convicted for selling adulterated milk, nearly all of them on the certificates of Professor Chandler, of Columbia College. The fines varied from a minimum of 5 dollars to a maximum of 250 dollars, and the total amounted to no less than 8,330 dollars, a sum which seems to us *almost* sufficient to pay the analyst's salary. If milk dealers in London were fined on the same scale, we should soon have a better supply of milk here. It is certainly also very creditable to a New York newspaper to publish in detail like this the names and addresses of the milk dealers, and the number of times each has been fined, in order that the public may have an opportunity of judging from whom they had better purchase their milk.

We note also with particular satisfaction that in three cases the offenders were sentenced to imprisonment, without the option of a fine; thus one was sentenced to a month in the penitentiary, and for a second offence thirty days more, while two others appear to have received sentences of thirty days each, apparently in addition to the fines.

LAW REPORTS.

CONVICTION FOR SELLING "FORE" MILK.

A dairy proprietor, Michael Hayden, residing at Clarendon Street, Dublin, has been convicted by Mr. Woodlock, Divisional Police Magistrate, for selling to the Inspector of food, milk which "was not of the nature, substance, and quality" of the article demanded. Dr. Cameron, public analyst, deposed that the milk was either "fore milk," or had been deprived by skimming of a portion of its cream. The defendant admitted that it was "fore milk," and that he had sold the "stripping" as cream, believing that he was allowed by law to do so. The magistrate expressed his opinion that milk should be sold whole," *i.e.*, with both fore milk and strippings, and fined the defendant £10.

Coloured Confections—At the Sheriffs Court, Glasgow, on the 30th June, before Sheriff Lees, William Caldwell, confectioner, 619, Gallowgate Street, was charged with having sold 1lb of confections known as "Coloured Imperials," which were "mixed, coloured, stained or powdered," with chromate of lead, etc. A plea of guilty was tendered, the accused explaining that he was not aware the confections contained any injurious ingredients. The sheriff imposed a fine of £2, and explained that, legally, the want of knowledge did not remove culpability. Mr. Tatlock, one of the public Analysts for Glasgow, made the analysis in this case, and found ·54 grains of chromate of lead per lb of the yellow confections.

At the Southwark Police-court, recently, Mr. John Morris, cheesemonger, 152½, Blackfriars-road, was summoned before Mr. Benson by Mr. John Edwards, Sanitary Inspector of St. George's Vestry, for selling as genuine butter a compound containing not a particle of butter. William Connor, assistant to Mr. Edwards, said that from directions he received from him on May 29, he went into defendant's shop and asked for half a pound of fourteenpenny butter as marked in the window, which was served to him. He paid 7d. for it, and instantly handed it to Mr. Edwards in the presence of the manager. Mr. Edwards said he was appointed by the Vestry under the Adulteration of Foods Act, and owing to complaints he had received, and seeing the "butter," marked at fourteenpence a pound, he was positive it could not be genuine. He accordingly directed his assistant to purchase half a pound; this was done in his presence, and the "butter" handed to him. Witness then entered the shop and divided the butter into three portions, one of which he took to Dr. Muter for analysis. The compound when handed to witness was wrapped up in ordinary paper, and there was no label or other mark on it. Mr. Benson asked if he had received any particular information. Witness replied that he had not. It was a large shop and things were marked up too cheap to be genuine. On those grounds chiefly he visited the shop. Witness here handed in Dr. Muter's certificate. Mr. Benson after perusing the latter, observed that the result of Dr. Muter's analysis was that it was nothing but animal fat made to resemble butter, but it was not injurious to health. It was, in fact, not butter at all. The defendant's manager, who attended, said that it was not sold as butter. He handed in to his worship an old brief-sheet, on which was marked "Notice.—This compound

is sold as imported, and declared according to the Act, 1875, cap. 63, sec. 8." Mr. Benson told him that if the butter or compound was wrapped up as stated by him, that label did not assist him, and asked where the stuff was manufactured? The manager said he did not know. They bought it of a wholesale house. It cost 1s., and they sold it for 1s. 2d. per lb. Mr. Benson told him he must not sell such stuff as butter. He might describe it as a foreign compound equal to butter, or superior to butter. If he did so he would not be punished. The manager said that only 28lbs. of it had been sold, and no more would be offered. Mr. Benson fined defendant £5, and 12s. 6d. costs.

At the Petty Sessions, Southampton, the sitting magistrates being the Mayor (H. Abraham, Esq.), Dr. Hearne, Alderman Tucker, J. H. Cooksey, and S. M. Emanuel, Esqs., Mr. William Henry Rogers, grocer, of Queen's Road, was summoned for selling adulterated butter. Evidence of the purchase having been given, the analyst's report stated the butter in question to be adulterated with foreign fat to the extent of 74 per cent., but the article was not injurious to health. Dr. Hearne said the statement coming from a non-medical man that this butter was not injurious to health he could not accept. Mr. Rogers pleaded guilty to the charge, but he said he was perfectly innocent that he was selling an adulterated butter, he having bought it from a respectable London firm as genuine Normandy, and retailed it at 1s. per lb. The Bench said there were extenuating circumstances, and if the defendant had obtained a warranty he would have had a remedy against the merchant he purchased it from, or, if he had described it to his customers as an adulterated article, he would have complied with the Act and escaped the penalty. As it was, he would be fined 10s. and costs.—Mr. Richard Odell, grocer, of Cambridge-terrace, was also summoned for selling coffee not being of the nature, substance, and quality demanded. The certificate of Mr. Collis, the Borough analyst, described it to contain chicory in quantity amounting to 32 per cent. Defendant pleaded guilty, but said he sold the article as he had received it. The magistrates told him if he bought it as pure coffee (the seller representing it as such), under the Act he had a remedy against the person he purchased it of; but if he was aware that he was selling a mixed article he should have labelled it as such. The Bench inflicted a fine of 10s. and costs.

At the Hull Police-court, before T. H. Travis, Esq., stipendiary magistrate, Thomas Stainton Cartwright was summoned for selling a quantity of butter which was not of the nature, substance, and quality of the article demanded by such purchaser. Mr. Todd, town clerk, prosecuted. It appeared that on the 28th ult., Mr. Dale, nuisance inspector, obtained from the defendant 1lb. of butter for analysis He asked for butter, and was served with a quantity, for which he paid 1s. After the purchase was made the inspector said that it was for analysis, and the defendant said, "Oh, dear me! It is butterine. What can I do?" and added, "It's no use kicking against the pricks." The analyst reported that the compound did not contain any real butter, but was a manufactured article to imitate butter. It also contained iron. probably from the colouring matter used. 95.43 was insoluble fatty acids in fat. Mr. Todd said that he was told that about a million hundredweight of the compound, which was called butterine, had been imported from America. It was made from the refuse of cottonseed, so he was given to understand. In its normal state it was frightful to look at, but by certain processes it was converted into a beautiful compound, like lard, and, being coloured to look like butter, it was sent to this country. Mr. Todd added that the defendant admitted the offence. In the course of the case Mr. Travis read some extracts from a circular which had been handed to him. It stated that the "extreme scarcity and consequent high prices of butter rendered 'Normandy Oleine Butter' in largely increased demand. . . . It was almost unaffected by the weather, and had no strong wintry rankness, inevitable in the lower qualities of Normandy butter, being always alike sweet and uniform, leaving no tailings as with the irregular Canadian or States shipments. Its keeping qualities were better than those of common butter; the more salted brands of the cheaper sorts would stand quite good for two months and longer. The shade of colour could always be easily adapted to the requirements of a district, from the pale straw colour to the deep lively shade of Irish. . . . The Oleine butter was cleanly and taking to the eye, easily manipulated on the counter, and lastly, though not the least important, if sold to the consumer as 'Oleine butter,' according to most eminent counsel's opinion—it was strictly in accordance with the requirements of the Food and Adulteration Act, and no retailer had ever yet been convicted for thus selling it." The circular created much amusement in court. After reading it, Mr. Travis told the defendant that he had not only acted illegally, but foolishly, for he had not even followed the directions of the wholesale dealer, which told him how to evade the law. The defendant said that the circular was not his, and he had never seen it. He was fined 60s. and costs.

Robert Coulson, provision merchant, was also summoned for a similar offence. Mr. Todd prosecuted and Mr. Summers defended. Mr. Todd said that on the 25th ult. Mr. Dale, the inspector, visited the defendant's shop, with his assistant, Mr. Osborne, for the purpose of obtaining butter for analysis. Defendant's son was in the shop, and on Mr. Dale asking for a pound of butter he said that they had no butter in the place. The inspector looked round, and saw a tub marked "Oleine Butter." He obtained a pound of it, for which he paid 10d. The defendant came in at

the time. On analysis the article was found to contain 91½ per cent. of foreign fat, and the analyst described it as butterine of a very low character. Mr. Dale deposed to these facts. Cross-examined by Mr. Summers, witness said defendant's son told him that he did not sell the article for butter, but for "butter and what was in it," and the defendant said that he had no butter he could guarantee. There was a label on the tub bearing the words, "Normandy Oleine Butter," and a placard in the window stating that the article could be obtained inside the shop. Defendant also said that he did not sell any Oleine butter without enclosing it in paper, on which was printed "Finest Butterine." Dr. Holden, the medical officer of health, deposed to seeing a fixed board, between defendant's shop and the next one, on which were the words, "Coulson's noted shop for choice ham, bacon, butter, and lard," and on a bill posted in the window, "Prime grass butter, a shilling a pound." By Mr. Summers: He did not know whether the board and bill were exhibited on the 23rd ult. After some evidence from Mr. J. Baynes, jun., analyst, who said that 8½ per cent. of the article was genuine, Mr. Summers addressed his Worship for the defence, contending that the defendant had not misrepresented the butter, but that he had properly described it. Mr. Travis said that he was of opinion that in defendant selling the butter as "Normandy Oleine butter" he was attempting to deceive; and, secondly, that he had no right to use the words to a thing which contained 91½ parts of foreign fat. If they wanted to sell these things let them sell them under names which could not deceive. They had no right to say "Oleine butter" or any other kind of butter unless the article was in a great part genuine butter. He was of opinion that in that case the article was not of the substance demanded. If defendant sold the article he must describe it by a name which would not deceive. To sell it properly defendant must put up a notice, "Not sold as butter." He respited judgment. Mr. Summers said the case was one of great importance, to manufacturers particularly. He did not know what instructions he might receive from his client, but he might have to ask for a case. His Worship said that whilst judgment wat respited he could not grant a case, but if the defendant persisted in selling the article as he had done, calling it butter, he would fine him the full amount the law allowed, and then grant a case if asked for.

William Shaw, provision merchant, was summoned for selling as a pure article 1lb. of "Irish butter," the same consisting of two parts of butter and one part foreign fat. The town clerk prosecuted. Mr. Laverack defended, and admitted that it was sold to Mr. Dale as genuine Irish butter. The defendant expected it was so, inasmuch as he had bought it as being a pure article, and paid the highest market price for it. Mr. Laverack said he had a telegram from the seller in Ireland, which offered "extra fine lumps of Irish butter." Evidence was called to prove that in the trade those words were looked upon as being a guarantee of the purity of the butter purchased. The question was raised on behalf of the defendant as to whether the telegram amounted to a written warranty; if so, Mr. Laverack contended that he was entitled to be dismissed. Mr. Laverack further said that if the Court did not think that it amounted to a written warranty the defendant still had the power of proceeding against the original vendor. It was stated that the butter cost the defendant 1s. 1d. per lb., and he sold it at 1s. 2d. per lb. Mr. Travis said he thought the defendant practically had a right to offer the butter as a genuine article on the strength of the telegram. His Worship dismissed the summons.

Adulterated Oatmeal.—The adjourned case of summons against Mr. E. Heelis, of West Bromwich, for selling adulterated oatmeal, came on for hearing before Mr. James Watson, Mr. Williams, and Mr. Ralph Heaton, the sitting magistrates, on the 7th ult. It will be recollected that this prosecution was instituted by Mr. Horder, and the analysis of Mr. Jones showed that the oatmeal contained 24 per cent. of meal, chiefly barley. A reference to the authorities at Somerset House was asked for, and granted. On Saturday last the certificate of Mr. Bell and others showed that there was 22 per cent. of meal (not oat) in the article. The magistrates fined the defendant 10s. and costs. Mr. Tanner explained to the Bench that Mr. Heelis had purchased the meal in the good faith that it was pure, and the millers who had sold it also considered it good oatmeal; but the defendant had determined not to purchase any more without a guarantee, neither would he continue to sell it.

At the West Hartlepool County Police Court on Monday, John Cranston was summoned for selling adulterated oatmeal. Mr. Marley proved purchasing one pound of oatmeal at the defendant's shop, on the 10th inst., a portion of which he forwarded to Mr. Edger, the County Analyst whose certificate, showing that the article was adulterated with 4 per cent. of barley, he now produced.—Mr. Cranston said he sold the oatmeal as he purchased it, and inquired if he had any remedy against the merchants.—The Bench replied not, unless he had a written warranty from the vendor, which they advised him and other tradesmen to obtain when buying articles liable to adulteration. As the case was not a serious one, the Bench imposed a fine of 1s. and costs only.—Mr. R. C. Black was then charged with a similar offence. The certificate of the Analyst was put in, showing that the oatmeal in this case was adulterated with ten per cent. of barley. In answer to the charge Mr. Black said that since receiving the summons he had communicated with the parties from whom he purchased, who guaranteed the purity of the article, and who requested an adjournment in order to contest the case. The application was agreed to.

At the adjourned hearing it was stated by the defendant that since the first hearing he had sent two samples to be analysed, but had been advised to ask the Bench to have it analysed first.—This Mr. Superintendant Marley said had been done, as had been proved last week when it was stated that the amount of adulteration was 10 per cent.—Mr. Black said that he had sold the oatmeal just as he bought it, and he wished that the Bench would deal with the case as they saw fit; and their Worships, believing that the defendant had not been guilty of act of fraud personally, thought a nominal fine of 10s. and costs would fully meet the justice of the case.

ANOTHER EXCUSE FOR WATER IN MILK.—At a recent meeting of the Nenagh Board of Guardians the wife of the late milk contractor to the workhouse sent in a declaration with regard to the purity of her milk from water, though Dr. Cameron, on analysis, pronounced a sample sent to him to contain 10 per cent. of adultration. She further declared that if by analysis or testing, her milk showed any portion of water, it must have been produced by the milch cows having been fed in the early part of April on mangold wurtzel. The defendant was fined £2 10s. and 10s. costs, on the production of the certificate of Dr. Cameron, that the milk supplied contained 10 per cent. of water. Commenting on this case, the *Nenagh Guardian* says—"We are aware that the leaves of the mangold are much relished by cows, and produce an abundant flow of milk without any bad flavour, though its richness may be doubted, but we never before heard or read of mangolds as a water adulterant."

At Belfast there has been a conviction for the sale of milk of sulphur under the name of precipitated sulphur, and after a long argument the bench imposed a penalty of £20. On being subsequently appealed to, however, the bench reduced this to £2 10s.

AT MARYLEBONE John Gillman, of 10, Dorset Street, Joseph Miller, of 139, Seymour Place, Charles Lewis, of 113, Crawford Street, and Frederick Ubee, of 18, Spring Street, were summoned for selling milk diluted with water. Mr. Greenwell, solicitor, and Clerk to the Vestry of St. Marylebone, prosecuted; Mr. Ricketts defended Miller. Ubee's case was adjourned, as he was not in attendance. The water added in the other cases was not large, and the defence set up in each instance was that the milk was sold in the same state as it was received from the wholesale dealers. Mr. Cooke told the defendants that that was no excuse, as they were liable under the Act. It was somewhat hard upon them, as they were made answerable for that which in a certain degree they could not control. The defendants were each fined 5s. and costs.

At the Bradford Borough Court three persons were recently prosecuted for the sale of diluted sweet spirit of Nitre. The defendants were Stephenson Brothers, grocers, George Batty, herbalist, and J. R. Lund, chemist. The three samples tested contained respectively 26 per cent., 27 per cent., and 20 per cent. of water more than the standard. They were almost tasteless, and gave but very faint indications of the presence of nitrous ether. For the defendant Lund it was argued that a weaker spirit of nitre than the standard was a regular article of sale. This had been sold at 2½d. per ounce, at which price the the standard article could not be obtained. The magistrates imposed a fine in each case of £1 and £3 10s. costs.

The Estimation of Nitrogen in Nitrates.—The method recommended by Thorpe, in his *Quantitative Chemical Analysis* for the determination of nitrogen in nitrates, has been examined by S. W. Johnson, of Yale College. The plan referred to consists in reducing compounds containing nitric acid to the form of ammonia by the use of strips of zinc covered with copper, by the "couple," in short, devised by Gladstone and Tribe. The author gathers from Thorpe's paper, that "the results are such as apparently establish its great exactness, while in simplicity and ease of execution it would seem to be quite superior to the similar methods which have been previously proposed." The first determination which Johnson made by Thorpe's process showed a deficiency of 45 per cent. In a second experiment nitric oxide was evolved, "the standard acid not only not being neutralised by ammonia, coming from reduction, but made more acid by the reaction of nitric oxide upon the oxygen and water of the condensing vessels." In the third and fourth experiments the results were equally unsatisfactory. The author then made three determinations by Bunsen's method with zinc-iron couples and caustic potash, and obtained concordant and perfectly satisfactory results, the numbers, it should be stated, being uniformly 0·3 to 0·6 per cent. under that required by theory.—*American Journal of Science.*

Analysts' Reports.– At the Staffordshire Sessions on the 2nd inst., it was stated that 192 samples had been delivered to the county analyst in pursuance of the Sale of Food Act, and of these articles fifty-three were reported to be adulterated. In the prosecutions, numbering thirty-three, only seventeen had been sustained.

At the Warwickshire Midsummer Sessions, on the 3rd inst., Dr. Bostock Hill, the county analyst, reported that he had analyzed samples of food supplied to him by the inspector for the Meriden District. The teas were all genuine, but six out of seven samples of coffee were adulterated with chicory. The samples of cocoa were such only in name, consisting almost entirely of sago, starch, and sugar. Mustard samples were all of good quality, excepting two which were adulterated. Of eleven samples of pepper, only one was a little adulterated. Flour, bread, butter, oatmeal, sweets, and biscuits were all genuine. Ale was found to be genuine, except one sample, which contained a small quantity of salt. Two samples of brandy were genuine, and two under proof. The sample of rum was 30° under proof. Port wine, sherry, and peppermint were all genuine. Of eighty samples, fourteen were adulterated, the percentage being 17·5 per cent., as compared with 17 per cent. in the last quarter. These results, the analyst stated, were obtained in the district of Meriden, but he believed that a greater degree of adulteration prevailed in other districts. The report was quietly laid on the table, and did not elicit a single remark.—

The quarterly report of the Salford Borough Analyst states that, among others, seven samples of butter and three of pickles were examined, and of these, three samples of butter were found to be adulterated.

Dr. Hodges, of Belfast, reports that he has analyzed 131 samples from the borough of Belfast this year, and 96 samples from the County of Antrim; among other cases mentioned, a druggist has been fined £10 for refusing to sell sulphate of quinine.

Mr. A. J. M. Edger of Newcastle, reports having examined 180 samples during last quarter, of which 52 were adulterated viz. 10 samples of milk, 1 of butter, 1 of lard, 11 of oatmeal, 9 of pepper, and 20 of spirits.

THE SALE OF DISEASED MEAT IN DUBLIN.

A dispute has lately arisen between the Guardians of the North Dublin Union and Dr. Cameron, the City Analyst. The facts of the case are that the Guardians' Inspector authorised the sale of the carcase of an animal slaughtered for pleuro-pneumonia, and that Dr. Cameron condemned the meat as unfit for food. At a recent meeting of the Guardians it was stated that beasts slaughtered in different stages of pleuro-pneumonia were sold in London as food under the Cattle Diseases Act. To this absurd statement Dr. Cameron gave a positive denial. The Chairman seemed to consider that the opinion of a veterinary surgeon as to the wholesomeness or unwholesomeness of the flesh of an animal more or less diseased was of equal weight with that of a physician. The majority of the Guardians agreed with their Chairman, and resolved, by a majority of 9 to 2, that it was desirable that a referee should be appointed to decide between the Inspector and Dr. Cameron, in cases where they differed in opinion. So the matter stands at present, but we understand that the whole subject will be brought before Parliament by Dr. Cameron, M.P. for Glasgow. The conduct and opinions of the majority of the Guardians cannot be too strongly condemned, and it is fortunate that the magistrates of Dublin, when dealing with cases in which diseased meat has been offered for sale, prefer the opinion of a physician who is withall a competent man to that of a veterinary surgeon.

POISONING OF FOURTEEN MEN BY SUGAR CONTAINING ARSENIC.

About ten days ago, our readers will remember, the Glasgow papers published the report of the officials of the Board of Trade who had been appointed to enquire into the circumstances attending the deaths of six of the crew of the ship *Crown Prince*, and the dangerous illness of eight other men on board that vessel, from suspected poisoning during her voyage from London to various ports on the coast of South America in the latter part of last year. Their report attributed the illness of the men to their having eaten some semi-putrid pork, a barrel of which was proved to have been served out to them about the time of their illness. This theory failed to account fully for the circumstances of the case, inasmuch as one of the men who died was sworn never to have touched the pork, and several other persons on board also suffered from the symptoms of irritant poisoning without having eaten any of it. The captain attributes the illness and deaths to something in the sugar used by the men, stating that none but those who had partaken of the sugar had ever been affected. In consequence of this statement of the captain, before the opening of the Board of Trade inquiry the owners of the vessel requested Mr. Tatlock, the city analyst, to make an examination of the sugar, and, on doing so, he found there was mixed up in it a large amount of arsenic. On a further analysis, so great was the proportion of that poison found to be that a pound of sugar

contained nearly 13½ grains of arsenious acid, or about enough to kill two men. The theory of arsenical poisoning by means of this poisoned sugar perfectly explained some of those facts in the case which were not in accordance with that of poisoning by putrid pork. It explained, for example, how those who used the cabin supply of sugar, which was pure, had not been affected, while every one who had partaken of the forecastle supply had suffered. It explained how the cook and his wife had sickened through partaking of some sauce sweetened with this forecastle sugar, and it explained how a crew shipped at Monte Video had suffered from sickness, although the bad pork had not been served up to that time. It further explained how one member of the crew who used no sugar had escaped altogether. The result of Dr. Tatlock's analysis was, we believe, communicated to the Board of Trade officials, who for some reason or another in their report, although incidentally referring to the captain's allegation that the sugar used by the men was poisonous, make no further allusion to the matter, and, as has been said, attribute the fatalities entirely to bad pork. Dr. Tatlock, in consequence of their report, put himself in communication with the officials of the Board of Trade, who replied to him that they had forwarded his statements to London, along with their report. Many days having elapsed, however, and nothing further having been heard of the case (possibly owing to the absence of the President of the Board of Trade from his office, in consequence of his recent bereavement), Dr. Tatlock communicated with the members for the city, requesting them to take what steps they considered proper in the matter. In consequence of Dr. Tatlock's letter, Mr. Anderson yesterday had an interview with Mr. Stanhope, Secretary to the Board of Trade, who, we believe, at once put himself in communication with the Board of Trade officials in Glasgow, and the probability is that the inquiry will be re-opened.—*North British Daily Mail.*

NOTES OF THE MONTH.

We reprint the report of a case of oatmeal mixed with barley which is especially interesting as showing a wonderful concordance in two separate analyses. Mr. Jones reports "24 per cent. of meal chiefly barley," and the inland revenue chemists find "22 per cent. of meal not oat." This is the more satisfactory when we consider that in such microscopic determinations there is really room for considerable divergence of opinion as to quantities.

Here is a delicious little piece of ingenuousness from a trade journal: "In fact the analytical star has not shown very brilliantly of late, and *the more it is obscured the more we shall like it*." No doubt, Mr. *Grocer*, because it is evident to the meanest comprehension that turning the honest penny by selling chicory and flour for the price of coffee and mustard respectively is really a remunerative undertaking. If by the analytical star shining our friend means convictions for adulteration, then we would respectfully suggest a simple and efficient means of making it set altogether. Let him persuade the persons he represents to stick to the letter of the law, and always sell that which they pretend. If the traders would only do this, no body of persons would be more thankful than public analysts, who do not relish wasting their time in police courts more than is absolutely necessary for the carrying out of the duties imposed on them by the state.

Listen to the latest scoundrelism of that worst of monsters the Public Analyst. Not content with honestly seeking his prey, "it is observed," says the *Grocer*, "that, as a rule, samples are taken from the shops of the smallest traders, it being apparently presumed that there will be less trouble with them than with those in a more substantial position." It is really a pity that such a profound and masterly exercise of the talent of observation should stop short of noticing the fact that the monster has nothing whatever

to do with the collection of samples, and cannot, even to satisfy his terrible greed for victims, in any way interfere with the work of the inspectors, who are perfectly independent officers, and would resent his slightest hint as to the performance of their duties.

We are not so sure, after all, that Government support of science is an unmitigated blessing. Earnest workers, at their own cost, will always be found, but immediately it becomes a question of giving away money, so soon does jealousy and all uncharitableness arise in the breasts of those interested. The tendency of any Government is to dispense its favours to those best known to the men in power, and consequently we have certain persons eating the oyster while only the shells fall to their less fortunate brethren. It is not to the poor and struggling man of science that the prizes fall, but to those already enriched, and who for the time become poor on paper, and, like the eminent head of the Challenger expedition, unable to earn any money by "literary or other employment." Those interested in fairly considering the matter should read the articles which have lately appeared in the *Echo*, and we think that on the broad question, and putting aside all discussion as to jobbery in any particular case, they will agree with us that science were better left to be self-supporting, than subsidised for the benefit of the few and the neglect of the remainder. It is not to the credit of men of science that a journal should even have a *prima facie* case to call forth such comments as those invoked by the Challenger expedition and by the doings at South Kensington. The list we publish of fortunate recipients of a portion of the £5,000 granted by the Government will very probably call forth further remarks.

If only a tithe of the terrible letter which has appeared in the *Medical Examiner* of 12th July be true, then the present system of making bread is, to say the least, utterly repulsive. The picture of half-naked men throwing cockroaches and other even more disagreeable insects at each other in play, and then plunging half-naked and all dirty into the dough, while they add to it flavouring ingredients in the shape of perspiration, and neglect the use of pocket handkerchiefs, is not at all appetising. No wonder that, after making the dough in such dens of dirt, the bakers are tempted to add a little alum to whiten the sepulchre. Surely bread-making by machinery would be demanded if the public understood the case, and meantime have we no Government provision for the inspection of bakehouses, so as to at least ensure ventilation and cleanliness?

It is, of course, acknowledged by everyone that the process of manufacturing white lead is necessarily an objectionable one, and dangerous to health but it is really astonishing to find what singular inventions are brought forward from time to time with the object of preventing its injurious effects. Among the latest of these we have seen is a process invented by a Mr. Thompson, who, with a cool ingenuity which is quite refreshing, and an equally remarkable ignorance of the process which really takes place in a white lead stack, seems to think that all that is necessary in order to make white lead is to bring metallic lead into contact with carbonic acid. Consequently he builds a gas-tight chamber, with doors at each end, and a line of rails running through it. On these rails a carriage runs, and the metallic lead, in some way not very clearly defined, has to be stacked on to this carriage, which is outside the chamber, and the

carriage is then run along the rails into the chamber. The doors are to be closed, and the carbonic acid gas pumped, this pumping apparently to be continued without intermission until the whole of the lead has been carbonated or converted into white lead, *i.e.*, probably for some three months. Mr. Thompson's ingenuity, however, does not stop here, for in order to prevent any possibility of the carbonic acid gas being wasted by acting on the chamber itself, the cells are to be lined with glass. We need hardly say it will be many years before such a process as this is taken up.

Another ingenious inventor thinks that the principal cause of injury to health which occurs in white lead manufacture results from the dust rising from the pulverised white lead adhering to the skin, and being to some slight extent absorbed. No doubt this is partly true, but his remedy is certainly unique. The hands and face, in fact all parts of the body exposed to dust are directed to be washed three times a day in petroleum. We think that, like the last-mentioned invention, it will be a long time before this practice comes into general use.

But considering such statements as these, which are made on the authority of respectable journals, it really seems necessary to repeat, what every white lead maker ought to know, that the best remedy to prevent injurious effects among the workpeople is to insist upon thorough washing with plenty of soap and water, carefully avoiding anything in the shape of an alkali, adding, if anything, a few drops of sulphuric acid to the water in order to give it a slight acidity, and also adding a few drops of acid to the water which the workpeople drink, as sulphuric acid converts the lead, in whatever form it may be, into an absolutely insoluble substance, and therefore of course prevents its being injurious.

The subject of the payment of analysts by coroners is one which requires a most careful consideration at the hands of our legislators, when the whole question of Coroners' Courts comes up in Parliament. We are glad to see that the *Lancet* has taken the subject in hand, as we could tell some startling stories of analysts who have been obliged to waste days of valuable time in long and disgusting researches on semi-putrid matter, and then have been kept waiting for years for their fees, until, out of patience, they had to resort to the extreme measure of a summons. When a coroner believes an analysis necessary, he should be instructed to send the article, with a certificate to that effect, to the public analyst for the district in which the enquiry occurs, and on tendering that certificate at the offices of the county, the analyst should receive a fixed sum of so many guineas per day, according to the time he is employed in the analysis. We commend this to the notice of those at present considering the reformation of "CROWNERS' QUEST."

Space will not allow us to refer fully this month to a recent article in a scientific contemporary—an article evidently written with the object of supporting the proposed organisation scheme, but we give one quotation, which, coming from so favourable a quarter, will, we hope, be duly appreciated by those whom it concerns:—"The originators of this movement were *not* certainly and strictly speaking, professional chemists." Comment is needless, as this is one of the main grounds of objection to this proposed organisation scheme.

RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Southampton Row, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
903*	J. Cammack and A. Walker ...	Manufacture of Sulphates of Soda and Potash	4d.
4420	G. W. Von Nawrocki	Manufacture of Sugar	6d.
4461	J. C. L. Loeffler and R. W. Higgs	Electric Telegraphs	6d.
4526	G. Symes	Apparatus for Manufacturing Gas, &c.	6d.
4559	J. and J. Kidd	Manufacturing and Carburetting Gas	2d.
4576	C. F. Mathieson...	Manufacture of Gas	6d.
4595	W. R. Lake	Electro-Magnetic Engines...	6d.
4613	W. Young	Manufacture of Illuminating Gas...	2d.
4636	P. Moritz	Electric Night Signal Apparatus	6d.
4655	J. S. Butler	Preparation of Aniline Dyes	2d.
4721	E. Rumbold	Purifying Sewer Gas	2d.
4751	F. T. Bond	Production of Sulphurous Acid Gas	2d.
4758	D. McKechnie	Treating Oxides of Iron	2d.
4779	W. P. and C. E. Cherry ...	Manufacture of Gas	2d.
4791	A. Graham	Obtaining Fatty Matters from Sewage, &c.	2d.
4805	R. Werdermann...	Electric-Light Apparatus	6d.
4806	J. W. Bantock	Manufacture of Nitro-Cellulose	d.
4848	G. Rydell	Treating Sewage, &c.	4d.
4900	J. J. Hicks	Thermometers	2d.
4954	E. Simmonds	Composition for Rendering Walls Impervious and Damp Proof	2d.
5007	W. Morgan-Brown	Preparing and Applying Oxygenated Air for Combustion	4d.
1877.			
91	E. Solway	Manufacture of Hydrochloric Acid	2d.
171	Ditto	Utilising Silicates and Aluminates of Lime and Magnesia	4d.
952	S. Hallsworth and R. Bailes ...	Treating and Clarifying Sewage	4d.
1423	W. R. Lake	Machinery for Manufacture of Sugar	6d.

Sale of Food and Drugs' Act, 1875.—Three members of the House of Commons have brought in a Bill to amend this Act. Its general purport is that in determining whether adulteration is committed by diluting spirits with water, regard shall be had to the price at which the spirits so diluted are sold. This is certainly a new phase of the adulteration movement, and we shall be rather glad to know what will be the next.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The American Chemist; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Telegraphic Review; The Medical Record; The Geological Society's Proceedings; The Miller; The Anti-Adulteration Review

A correspondent writes, "Excuse the suggestion, but I think that analysts might each in their own district keep you properly informed of any information specially interesting to the members of the Society." We can only say that we wish they would do so, for such information would be of great value to the Society.

We have received a letter signed "B. Sc." with reference to Mr. Allen's paper on "Potable Waters." We shall be happy to publish the letter on receiving the writer's name and address.

THE ANALYST.

ORGANIZATION AMONGST CHEMISTS.

We have previously referred in these columns to a scheme which has been some eighteen months under consideration, for promoting organization amongst chemists, and we have, upon several occasions, given space to correspondents to point out the defects which they thought existed in the scheme. Some of our remarks, or the remarks of our correspondents, appear to have given offence to one of our contemporaries, who has recently warmly defended the scheme at present proposed, and who, by implication, charges us with breach of confidence in publishing private information, or information surreptitiously obtained on the matter. We emphatically deny this charge. All the information we have published has been obtained in the same honourable way as any other journal could have obtained it, if it had thought fit to do so.

Our own views on the matter are the same as they have been from the commencement. We quite agree that organization among *professional* chemists is in a general sense desirable, although the necessity for it is not perhaps so paramount as some would seem to think. A remark made at a meeting which has taken place in connection with the subject appears to us very much to the point. One of the speakers, a chemist of eminence, and a member of the organization committee said that "most of his "correspondents who were anxious for the promotion of the scheme had a grievance, "but the grievance was chiefly that they had not work enough to do."

We differ distinctly from the promoters of the "Institute of Chemistry;" first as to the objects which it can immediately accomplish. The promoters think *they* can discriminate between competent and incompetent chemists, and at once sift the wheat from the chaff so effectually, as to obtain the full confidence of the public, and drive the unfortunate chemists (?) whom they have, (by refusing to admit them as members of the Institute,) dubbed incompetent, to seek "fresh fields and pastures new." We have asserted from the first that they are unable to do anything of the kind. Men of business, who are the principal clients of professional chemists, are quite able to judge for themselves, as to the competence or incompetence of those whom they employ, and it will be many years before the Institute, even if it be formed at all, will exercise any appreciable influence in this direction. The only real foundation upon which the Institute can be started is, that every analyst who has been in practice for say one year, and who cannot be proved to have been guilty of unprofessional conduct, whatever that may mean, should, if he so wish, be admitted as a member. The Institute will thus be formed in precisely the same way as the Medical and Pharmaceutical Professions were organized, and the Society of Public Analysts was formed, the condition however being, that all who desire to claim admission on these terms, *i.e.*, compulsory admission, must do so within some definite time, say within three months of the formation of the Institute. After that time every fresh applicant for admission, whether he bears an honoured chemical name or is a young and unknown aspirant for scientific honours, should be compelled to pass a certain examination, and that examination once passed, his title to the advantages of the Institute, whatever they may be, should be as clear and indisputable, as the title of a man who has passed the proper examinations at the London University is to his B.Sc. degree.

In the second place we differ from the promoters because we hold that if such an Institute as this is to be of any use at all, it should not be a miscellaneous body, composed of men of science and men of letters, but must be strictly confined to *professional* chemists. We shall, of course, be expected to give a definition of what we mean by professional chemists, and our definition shall be a plain one; we understand by the term, men who earn an income, even if it be a poor one, (we will not say a *living*, or we should exclude many of those who might otherwise be eligible,) purely by the practice of professional chemistry as distinguished from pharmacy. We need hardly say that this definition would exclude many of the promoters of the present scheme.

It is not at all surprising that having made these two fundamental mistakes, the promoters should in their attempts to launch this scheme have fallen into others only a trifle less serious. Having come to the conclusion that such a scheme was desirable, their first step was to call a meeting, and this meeting, which was to consider the whole subject, should of course have been a public one, open to every professional chemist in "Great Britain and Ireland," instead of which it was convened by a private circular, which appears to have been sent to few beyond the personal friends of the promoters; and although men of undoubted scientific attainments, but who were *not* professional chemists, were present, and even our continental *confreres* were represented, the meeting consisted of only about 40 persons; while some dozen or so well-known professional chemists whose names have appeared in the *London Directory* for years, and twice that number of provincial chemists were conspicuous by their absence. It might be urged that they were absent because they had no wish to be present, but in many cases we have found that it was not so. The meeting was in fact a gathering rather of theoretical chemists, than practical analysts.

A copy of the circular fell into our hands, and we sent our representative to report the proceedings, but—mistake again—he was told it was a *private* meeting, and although it was "not possible to prevent his reporting it, yet it would be looked upon as a great "breach of confidence," if he did. We did NOT report that meeting, but in front of us as we write is the transcript of the shorthand notes then taken, and after all that has occurred we can scarcely consider we are any longer bound to view them as private. At this meeting a small committee of 11 was nominated, but the names were not separately put to the vote. At the conclusion, it was stated that all present would receive a notice of an adjourned meeting to receive the report of this Committee, but—mistake again—notices were not issued, or at any rate were not received in accordance with this statement. The adjourned meeting also was a *private* one, and although we knew of it, we declined to send our representative.

So on with all the ordinary meetings of this body, and yet in the notice of one, now lying before us, we find the first words are, "The adjourned general meeting to consider "the subject of organization of the chemical profession will assemble." *General* and *private* are hardly synonymous terms, yet on the corner of this printed notice of a "general meeting" appears in writing the word "private." Comment is needless.

Nevertheless these "private" "general" meetings have been held, and the gentlemen attending them have appointed a committee of some 50 of their friends to carry the scheme through—mistake again—these 50 may be and perhaps are, the 50 most clever, most competent, and most successful chemists in the country; but if this is so, there can be no *doubt that if a public meeting* of their *confreres* had been duly summoned, these 50

gentlemen would have been elected, and they would then have held office by a public vote instead of a private vote, if any at all. Again, this committee having selected their officers, instead of at once calling a meeting and forming the society, and taking the opinion of the general body of professional chemists as to the future steps to be taken, trusting in time to secure a Royal Charter, if the Society should be found to merit it, arranged instead to register themselves as a Limited Liability Company, with a Board of Trade License, (if they could obtain it,) to omit the word "Limited," so that the title really should be "Institute of Chemistry, Limited." Fancy the Geological or Astronomical Society in such a position as this, and yet if this Institute is to go on at all, it should occupy a position, at least, as important as either of these two societies. But space will not allow us to continue; we have pointed out much, but we could say more. Our contemporary really argues strongly in favour of the views we have taken; his own words are "The originators of this movement were not certainly and strictly speaking professional chemists, or *at least some of them were not.*" The italics are our own.

One word of advice and we have done—mistakes, and grave mistakes have been committed, let them be at once rectified, it is not too late even now. Let a Public Meeting be duly convened by advertisement and circular to every professional chemist in the kingdom, and the matter be fully discussed; a really representative committee should then be elected by ballot, which committee would have the confidence of the profession. They can then go on, with strength instead of weakness, and, if fortune favours them, fairly achieve the object which we, as well as they, wish to see accomplished.

THE SOCIETY OF PUBLIC ANALYSTS.

THE country meeting of this Society was held at Plymouth, on the 17th August, 1877, as usual, during the meeting of the British Association; the President, Dr. Duprè, F.R.S. in the chair.

The minutes of the previous meeting were read and confirmed.

The names of the following gentlemen were proposed for election as members, to be balloted for at the next meeting:

Louis Siebold, F.C.S., Manchester; Thomas Jamieson, F.C.S., Aberdeen; Thomas William Drinkwater, F.R.P.S., Edinburgh; James John Day, F.C.S., Derby.

The President delivered a short address, referring chiefly to the question of copper in preserved peas, and taking exception to the views of Dr. Paul and Mr. Kingzett, the authors of a paper on this subject, read at the Pharmaceutical Conference. Dr. Dupré cordially endorsed the opinion expressed in that discussion by Dr. Redwood and others, as to the danger of permitting the sale of peas, coloured with copper, unless specially labelled to that effect, when people who might be foolish enough to desire such an article would purchase it with their eyes open.

Dr. Muter, in moving a vote of thanks to the President for his address, took occasion to refer to a leading case in connexion with the subject in which he had been engaged, and where the magistrate, having convicted for the presence of copper, the defendant appealed to the sessions; but, when the appeal came on, withdrew it, on the ground that he could not get sufficient weighty evidence in his favour.

Mr. W. Thomson read a paper, "On the Incongruity of the mode generally adopted

of stating results of milk analyses," and a discussion ensued in which Dr. Muter, Mr. Allen, and Dr. Dupré joined.

Mr. Allen read a paper " On the Determination of Alcohol in Ether and chloroform," and Mr. Jarmain, Mr. Fairley, and Dr. Dupré took part in the discussion.

Mr. Allen also read a paper " On the Detection of Strychnine," in reference to which a few remarks were made by Mr. Thomson and others.

The Secretary read a paper by Dr. Wynter Blyth, " On the Washing of Fats," the discussion on which was postponed, owing to the author's absence.

ON THE INCONGRUITY OF THE MODE GENERALLY ADOPTED IN STATING THE RESULTS OF MILK ANALYSES.

By William Thomson, F.R.S.E.

Read before the Society of Public Analysts, at Plymouth, 17th August, 1877.

For some time past it has occurred to me that the general mode of stating the results of milk analyses is illogical, and at all times places the analyst in a false position.

From the general mode adopted for making analyses of milk, analysts cannot, and have no right to say, that a sample is or is not adulterated with water, and they are equally unable to say whether cream has or has not been abstracted from the genuine milk.

It has been proved by many different analyses of genuine milk that the variation in its composition is so great, both as regards the fat and solids not fat, that no standard can be taken as representing the composition of genuine milk.

The total solids in genuine milk vary from 10½ to 15 or more, per cent. Up to the present time analysts have used standards, and have calculated from these standards the proportions of water added, and on this basis they say,—" This sample has been adulterated with so much water," and " That sample is free from adulteration."

The question I propose to bring before you is this. What is the law in these matters? Is it that it is illegal for any one to adulterate genuine milk with water; or is it that any one *may* adulterate his milk, provided he does not add too much water, *i.e.* that he does not dilute it below a certain standard?

Imagine the position of an analyst *versus* an inspector under two different and very possible circumstances.

In the first, suppose the latter sees a cow milked *dry* into a clean and dry vessel, and he takes a sample from it and sends it to the analyst, who finds it to be adulterated with water. In the second, suppose the inspector goes to a shop, and asks the vendor to sell him some milk; and presuming the latter, knowing that his milk is rich, says to the inspector, Sir! I adulterate my milk; and he forthwith takes three pints of his milk and one pint of water and mixes them together and sells part of the mixture to the inspector, who on sending it to the analyst receives a report to the effect that it is free from adulteration. What can be the inspector's opinion of the analyst? and yet, under the present state of affairs, such things may easily happen, but these only shew how the analyst may fall into public disrepute.

Here the effects of this objectionable mode of stating results do not end. If an honest man in a small town sell genuine milk, which is pronounced by the analyst to be

adulterated with water, the statement is published in the local newspapers, and the vendor suffers both pecuniarily and morally to a very marked degree. If adulteration of milk with water be an offence against the law, and the public be supposed to be injured by it, then the analyst, by his decided mode of expressing results, is constantly acting unjustly towards them, by passing adulterated samples; and if the "standard" method be recognized, then every milk seller ought clearly to understand that if he sell genuine milk, which should at any time happen to fall under the standard, he will be liable to be fined 5s. and costs, or possibly sent to prison for repeated offences against the Act.

If, again, the "standard" method be used, it would well pay a milk seller, who vends from 50 to 100 gallons of milk per day, to employ an analyst to analyse his milk two or three times a week, and from the results to add sufficient water to dilute the genuine milk to the standard, which necessarily must be low, and thus the public will have the satisfaction of learning that analysts, whom they have employed to protect them from adulteration, have secured to them an uniform supply of milk of low quality.*

It seems to me, first, that adulteration of genuine milk with water, no matter to what extent, should be considered illegal, and secondly, that the seller should be prevented from vending abnormally poor genuine milk.†

In the first, it is easily within the power of the inspector and analyst to find whether or no water has been added to milk, independent of any standard, because if, after buying a sample of milk, the retailer be required to declare from what farm the milk was bought, the inspector of the district in which such farm is situated, may be communicated with and requested to see the cows milked and to take a sample of the mixture, which should be sent to the analyst side by side with the sample originally bought. The actual amount of added water could thus be calculated from the difference in the results, and magistrates could then have no hesitation in convicting, and there would, in such instances, be little chance of miscarriage of justice.

I was led to write this paper at the present time owing to the following circumstance:—A man waited on me and stated that the inspector had taken a sample of milk which he sold to him. It had been sent to Dr. J. Campbell Brown, who reported it to be adulterated with 8 per cent. of water. The man said he was certain no water had been added and that the analyst had made a mistake, and requested me to analyse a sample which had been left in his possession by the inspector. I did so. The milk was decomposed, and on analysis I found the total solids, and solids not fat to be exceptionally low, and wrote to him to that effect, stating that the analyst was justified in pronouncing it to be adulterated. I said, however, he had one mode of defence left to him, and that was, that I should see the cow or cows milked dry into a clean vessel and take a sample of the genuine milk for analysis, and if it coincided in poorness with the suspected sample, it could be stated in court that the milk was genuine.

I went to his house at 6·30 one morning, which was the general time of milking, he explained to me that one cow yielded four gallons of milk, which was sufficient for his custom, and only that cow's milk was sold. I went to the shippon with him and there saw a light roan colored cow, *apparently* in good condition. He assured me it was perfectly healthy. I saw it milked dry into a tin, and at once mixed the contents and filled two bottles from it, the one was sealed in presence of the owner of the cow, and immediately

* This process has been carried on for a long time. (*Eds. Analyst.*)

† This is precisely what the law as at present administered does. (*Eds. Analyst.*)

afterwards I took both samples away, the sealed one I sent to Dr. Campbell Brown, who analysed and reported on the original sample, explaining the circumstances of the case; the other sample I submitted to analysis; both our analyses agreed in shewing that the genuine milk was of exceptionally low quality.

Dr. Campbell Brown very properly agreed to go further into the matter, and requested the inspector to see a sample taken from the cow and sent to him, this was done, and as it coincided with the sample originally analysed, the prosecution was withdrawn. The farmer a week afterwards forwarded to me the sample which had been left with him by the inspector, which I submitted to analysis, and the following are the results of these three samples obtained respectively by Dr. Campbell Brown and by myself, both our results coincide and serve to shew an exceptionally poor genuine milk.

	28th April, 1877. First Sample bought by Inspector.		May 14, 1877. Sample taken by Thomson.	Second Sample taken by Inspector from the cow.
Dr. Campbell Brown's results—	Fresh.	May 9, 1877. Decomposed.	Fresh	Fresh.
Fat	2·680	2·980	2·210	2·690
Solids not Fat...	8·297	7·321	8·190	8·503
Total Solids...	10·977	10·301	10·400	11·193
Ash	...	...	·682	·730
Specific Gravity	...	...	1·030	...
Cream	...	...	...	.
My own results of the same samples—		Decomposed. May 16, 1877.	Fresh.	Decomposed.
Fat	...	3·017	2·121	2·953
Solids not Fat...	...	7·612	8·347	8·080
Total Solids...	...	10·629	10·468	11·033
Ash	...	0·614	·658	·712
Specific Gravity	...	...	1·026	...
Cream, percentage by volume ...	...	...	7·000	...

In the discussion which followed, Dr. Muter pointed out the necessity, which he had frequently urged in *The Analyst*, of considering the amount and constitution of the ash of any sample of milk which might be submitted for analysis, in addition to the usual examinations for solids not fat. He urged that an analyst should not take any single point in the constitution of a milk as an absolute standard, but should make a thoroughly full analysis and apply common sense in considering the whole of the results. He had himself, on five or six occasions, met with milks containing so low an amount of "solids not fat," that had he not taken pains to examine the amount and nature of the ash, he might have been led to condemn unjustly.

Mr. Allen considered that the addition of water to milk was not only objectionable, owing to the fraud practised, but also from the danger of spreading zymotic diseases by the employment of impure water.

The President, in summing up the discussion, remarked that what was wanted was the fixing by Parliament of definite qualities, below which, it would be illegal to sell *both* milk and spirituous liquors.

NOTE ON THE DETERMINATION OF ALCOHOL IN ETHER AND CHLOROFORM.

By Alfred H. Allen, F.C.S.

Read before the Society of Public Analysts, at Plymouth, 17th August, 1877.

Several chemists have pointed out that crystallized fuchsine (acetate of rosaniline,) was insoluble in pure anhydrous ether or chloroform, but that it imparted more or less colour to these liquids when alcohol was present.

On making the experiment I found that fuchsine readily coloured a sample of commercial ether. When the same sample was well agitated with dry chloride of calcium to remove alcohol and water, it lost the power of dissolving fuchsine, becoming tinged only very faintly, when shaken with the dye.

To employ the above facts for the determination of alcohol in a sample of ether, I operate in the following manner:—

A minute quantity of powdered fuchsine is placed at the bottom of a narrow test-tube, 10 c.c. of the sample of ether added, the tube corked and the whole agitated. If the ether be pure and anhydrous the coloration of the liquid will be almost *nil*. If the coloration be considerable, 10 c.c. of ether which has been treated with chloride of calcium, is placed in another tube of the same bore as the first, adding fuchsine as before. $\frac{1}{10}$ c.c. of alcohol is then added to it from a finely divided burette, and the whole is shaken. If this quantity of alcohol is insufficient to produce a coloration of the liquid equal to that of the sample to be tested, a further addition of alcohol must be made until the liquids have the same depth of colour. The tint is best observed by holding the two tubes side by side in front of a window and looking through them transversely. The use of a piece of wet filter paper behind them facilitates the observation. It is well to permit the alcohol to drop right into the ether, and not allow it to run down the sides of the tube, as in the latter case it will dissolve any adherent particles of fuchsine, forming a solution which will be precipitated on admixture with the ether. For a similar reason it is not convenient to dilute the sample with pure ether so as to reduce the colour to that of a standard tint. In practice, each $\frac{1}{10}$ c.c. of alcohol added from the burette may be considered as indicating 1 per cent. of impurity in the sample. Of course this assumption is not strictly correct, but the error introduced is insignificant when the percentage of alcohol is small. The method is very suitable for small proportions of alcohol, but becomes difficult to apply when the latter exceeds 5 per cent. of the sample, owing to the intensity of the colour. The results are within $\frac{1}{4}$ per cent. of the truth. Occasionally the tints of the two liquids are not readily comparable, but on placing the tubes for a few minutes in cold water, this difficulty is overcome.

In attempting to apply the above method to the determination of alcohol in chloroform, I found that the latter liquid still dissolved fuchsine after treatment with chloride of calcium. By shaking with concentrated sulphuric acid it could be entirely purified from alcohol and water, but the product retained so much acid that it could not be directly tested with fuchsine. The acid could be got rid of by agitation with carbonate of potassium, but the chloroform so treated retained sufficient alkali to prevent the coloration by fuchsine. By employing dry precipitated carbonate of barium to eliminate the sulphuric acid, the chloroform was obtained so pure as to give only a very slight coloration with fuchsine, but the addition of a small proportion of alcohol readily caused

solution of the dye with production of the characteristic colour.*

The method commonly described for determining the proportion of alcohol in ether is the agitation of the sample with water, with subsequent observation of the diminution in the bulk of the ether. This method appeared very unpromising in presence of much alcohol, but on investigating it, I was agreeably surprised to find that with certain precautions, it was possessed of considerable accuracy. The following are the details of the procedure I have found preferable.

A small quantity of fuchsine is placed in a Mohr's burette furnished with a glass tap, which is then filled with water and a small proportion of ether, a cork is next introduced, and the whole agitated. By this means a coloured etherized water is obtained, in which ether is quite insoluble, while alcohol readily dissolves. 10 c.c. of the etherized water are run into a glass tube holding about 25 c.c., and having divisions of $\frac{1}{10}$ c.c., 10 c.c. of the sample of ether are next added, the tube corked, and the whole well shaken.

On the ether rising to the surface, its volume can be easily read off. Any reduction in its volume is due to admixture of alcohol. Thus each 0·1 c.c. lost, represents 1 per cent. of alcohol. If the proportion of alcohol in the sample did not exceed 20 per cent., the ether will be colorless, and the result of the experiment is correct; but if the proportion of alcohol is much above 20 per cent., the layer of ether is coloured, and the result is below the truth. The absence of colour therefore indicates the accuracy of the experiment. If the layer of ether be coloured, an accurate result can still be obtained by adding 5 c.c. of anhydrous ether, and again agitating. It is better, however, to dilute a fresh portion of the sample with an equal bulk of pure ether, and use the diluted sample instead of the original. By proceeding in this manner, the proportion of alcohol in mixtures of that liquid with ether can be ascertained within 1 or 2 per cent. with great facility. The process has been verified up to 60 per cent. of alcohol.

In all cases the proportion of alcohol must be deducted from the reduction in the volume of the ether, and not from the increase in that of the aqueous liquid. Care must be taken to prevent any volatilization of the ether.

PRESENCE OF METALLIC COMPOUNDS IN ALIMENTARY SUBSTANCES.

By B. H. Paul, Ph. D, F.C.S., and C. T. Kingzett, F.C.S.

Abstract of Paper read before the Pharmaceutical Conference at Plymouth.

1. Introduction.—Under the Sale of Food and Drugs' Act a number of prosecutions have been instituted during the last few years, having regard to the presence of metallic compounds in articles of food. Meanwhile, the knowledge possessed by either chemists or medical men as to the behaviour of such compounds upon the human system is extremely meagre. There can be no doubt that many mineral substances exercise a prejudicial influence upon health, but the measure and nature of this influence is in most cases an undetermined quantity, while it is probable that, owing to popular prejudices, a number of harmless substances are assumed to possess pernicious or poisonous properties.

* In attempting to find a coloring agent more suitable than fuchsine for use with chloroform, methyl-aniline-violet was tried, with the curious discovery that this substance is exceedingly soluble in chloroform, with intense violet colour. So great is the affinity of methyl-aniline violet for chloroform, that this liquid readily removes it from its aqueous solution, when agitated with it.

Mr. G. Jarmain informs me that he has observed the same fact, and has employed it for detecting the adulteration of indigo with methyl-aniline violet.

2. Preserved Peas and Copper.—A popular food which has been most severely remarked upon is preserved peas. The quantity of sulphate of copper added varies between one and two grains of the ordinary blue sulphate to the tin of peas containing from 9¼ to 9¾ ounces of peas, and 150 c.c. of liquor. The question of what influence this copper has upon health is one which has been hotly discussed, and widely differing opinions have been expressed by medical men.

It appeared to us that in order to arrive at a proper knowledge of the physiological influence of the copper contained in preserved peas, it was desirable to determine the following points:—

(1). Is the copper in mere admixture with the peas, or is it in actual combination?

(2). Does it pass into solution under the influences of the digestive processes?

(3). Is any part or all of the copper thus introduced in the stomach absorbed, or is it eliminated, and, if so, how?

3. Presence of Copper in Organic Tissues and Products.—Before proceeding to describe the experiments we have made relative to these questions, we may take note of the fact that from the time of Margraff, Gahn, and Vauquelin, chemists have been acquainted with the presence of copper in organic tissues and products.

In view of these facts we deemed it desirable to examine green peas for copper, and accordingly, two experiments were made with this object.

4. Method for Detection of Copper.—The method pursued throughout this investigation for the detection of copper may be at once stated; it consists in burning the suspected matters with a mixture of pure sodic carbonate and potassic nitrate, causing complete destruction of all organic matter; solution of the fused mass in dilute acid; and addition of excess of ammonia and filtration from alumina, phosphates, etc.

5. 80 grms. of green peas were examined and found to be absolutely free from copper.

6. The copper present in preserved peas is, therefore in actual combination.

7. The peas in stomachic digestion give up their copper to solution.

8. Is the Copper introduced into the Stomach absorbed, or what becomes of it? On the 13th July, the authors of this paper took each a dose of 0·3 grains of $CuSO_4$ $5H_2O$, and examined the urine eliminated during the next 48 hours; it was found to be entirely free from copper.

The fæces secreted on the 30th by one of us, after taking 3 daily doses of ·3 grain was examined, and was found to yield abundant evidence of copper, forming indeed a very considerable proportion of a dose.

Therefore, even if a part of the copper be absorbed into the system, another and *probably* the greater part passes out with the fæces.

9. General Considerations and Conclusions.—Inasmuch as copper is normally present in certain organs of the body as stated above, it must get there in the first place through an introduction into the stomach. How then can we reconcile this fact with the partial secretion, at least, of copper with the fæces? Apparently this is very easy of explanation. After gastric digestion and while the contents of the stomach are still acid, a part of the chyme is absorbed into the blood system, and this would seem to constitute the stage at which the copper is absorbed. The greater part, however, of the digested mass passes on through the pylorus, and undergoes a further change in the duodenum, where alkaline biliary fluid takes part in the process. The probable result as regards the

copper would be its precipitation as phosphate, which would not be changed in the intestines, but would be passed as such with the fæces.

Now, if it be considered that ordinarily one person consumes only about two ounces of preserved peas at a meal, and that this quantity would contain only a fraction of a grain of cupric sulphate; and if it be further considered that only another fraction of this amount is ultimately absorbed into the blood system, it is impossible to defend the opinion of the prejudicial influence of such amount of copper upon health.

This represents our conclusion based upon the experiments we have described, and we think it probable that quite as much copper finds its way into the system through the handling of copper coins, the use of copper vessels in cooking operations, and in the consumption of pickles and such articles which are often prepared in copper vessels. At least we believe preserved peas are absolutely innocuous to health.

10. Other Confirmatory Evidence of the Innocuous Nature of Traces of Copper present in Foods.—In a prosecution case conducted before the Marlborough Street Police Court, on Monday, January 22, 1877. Dr. Pavy expressed the opinion that 0·31 of a grain of copper (sulphate?) would not be injurious to health; this opinion was unsupported by any evidence.

In what has gone before we have supplied the evidence required, and these results are confirmed by, and confirmative of, other results recently communicated by M. Galippe to the French Academy of Sciences.* He has found that the administration of large doses causes vomiting, but that the same compounds may be taken in increasing amounts for prolonged periods of time without the attendance of any painful symptoms. Galippe cites the experiments of Burq and Ducom, who fed dogs with food that had been cooked and cooled in vessels made of copper, and previously exposed to the action of vinegar and salt; the dogs were not at all affected. Moreover, Galippe and his family have lived on food similarly prepared, without experiencing any poisonous effects.

Dr. Redwood said he had been engaged in the prosecution of some dealers in preserved peas, which were contaminated with copper, and should be inclined to say that the case which had just been brought forward was somewhat overproved. He referred to some cases where the poisonous effects noticed were without doubt due to copper. He was not prepared to say that a dealer was justified in supplying peas prepared with a substance which had an effect which was not necessary, and which was probably dangerous. If they were supplied, he thought they ought to be labelled "peas preserved with sulphate of copper." He had found two grains of copper in each tin.

Mr. Siebold protested against the notion that because the copper was eliminated therefore no poisonous effect would be produced. He instanced iodide of potassium and other medicines as also being rapidly eliminated, but which had undoubted medicinal effects.

Dr. Paul said the instances were not analogous. The copper passed through the system without being absorbed at all.

Dr. Rowe mentioned some instances from his own neighbourhood where streams, largely contaminated with copper, were indiscriminately drank by the population. In one case there was sufficient copper in the water to pay for its extraction; in another instance there was no less than sixteen grains to the imperial gallon.

Mr. William Thomson had for a long period given to a dog one grain of sulphate of copper per day in his food with no unfavourable results.

Mr. Chipperfield said that in the neighbourhood of copper works, while vegetation was almost entirely destroyed, and copper could be distinctly tasted in the air, it was a fact that the residents were remarkable for longevity.

* *Comptus Rendus*, April 9, 1877.

MILK ANALYSIS.

The following correspondence has appeared in the *Western Morning News.*

THE MILK DEALERS' GREIVANCES.

SIR,—If the writer of the letter headed "New Milk" in your paper a few days since had exercised a little patience, he would have been duly informed of the object of the promoters of the meeting of the cowkeepers held at the Plymouth Temperance Hotel, Treville Street, last evening. He anticipated the result of the meeting so far as the price of milk in future, which is to be 5d. per quart for raw and 2d. per quart for scald.

But the primary object of the promoters was to receive a certificate from Dr. Blyth to test how far his evidence may be taken as a Public Analyst. Last week a raid was made on the Stonehouse and Devonport dairymen, and on the evidence of the analyst that the milk was adulterated, they were convicted, and the magistrates imposed fines, together with costs, amounting to several pounds. Mr. Feesey was also summoned, and, after hearing the evidence of Dr. Blyth against him, he put a few very pertinent questions to Dr. Blyth, who gave very doubtful answers. Mr. Feesey then demanded a favourable verdict or that the milk be sent to Somerset House, for the purpose of substantiating Dr. Blyth's evidence or otherwise. This was not accepted, and verdict was given in favour of Mr. Feesey. As before stated the object of the meeting last night was to receive a certificate from Dr. Blyth, Barnstaple, as also from Dr. Oxland, Plymouth, two supposed eminent analysts, of the result of analysing two bottles of milk. On Monday last I went to Mr. Superintendent Wreford, Plymouth police, and asked that a policeman be allowed to go to my field, see a cow milked, and himself fill three bottles with said milk, one each for the analysts, and the other to be retained by the police constable, and seal each with the Plymouth Constabulary seal. Sergeant Monkley was entrusted with this duty, and he is prepared to swear in any court of justice, that he performed that duty faithfully. Now, what does Dr. Blyth say as the result of his analysing. "To Mr. Superintendent Wreford.—I, the undersigned, Public Analyst for the county of Devon, do hereby certify that I received on the 17th day of July, 1877, from police sergeant a sample of milk for analysis (which then measured half-pint), and have analysed the same, and declare the result of my analysis to be as follows" :—I am of opinion that same is a sample of adulterated milk, if sold as milk." Then followed the constituent parts of fat, water, &c. He then further states that "the milk this certificate refers to has been almost entirely deprived of its cream—there is no other adulteration," and signs his name A. Wynter Blyth, and sealed with a wax seal bearing his name, for which analysing a guinea was charged and paid. Query—Is an Analyst's fee a guinea or half guinea ?

Dr. Oxland, after stating that he had "received a sample of milk in a bottle, sealed with the Plymouth Constabulary seal, from Mr. Sayer," and stating constituent parts, says : "This sample has been skimmed ; the greater portion of the cream has been taken away." In the face of this result of analysing pure milk from the cow by two well-known analysts, is it not possible that a cowkeeper may at any time be brought before a bench of magistrates (they depending on the evidence of the Analyst), be branded as a cheat, and fined several pounds, as was the case at Stonehouse and Devonport last week, at the same time being perfectly honest, and selling pure milk. Surely, as it has been shown that possibly Dr. Blyth was mistaken in the Stonehouse cases, in saying that the milk was adulterated—as most assuredly he is with regard to the milk supplied pure from my cow, to be sworn to by the police sergeant—it ought not to be too late for the dairymen above referred to to have the benefit of the doubt, and refunded the money ; which to them, however, is not of so much importance as the "filching of a good name," which money cannot replace.

As a proof that the dairymen are desirous that the public shall have a pure article, the meeting resolved that the Mayors of Plymouth and Devonport be requested to convene a public meeting, for the purpose of considering the appointment of a Public Analyst for the towns of Plymouth and Devonport, conjointly. There was only one dissentient ; and the reason he assigned for voting against, was that in the face of the result of analysing, as shown by the certificates read that evening, it would be useless to make such an appointment. The possible results of the meeting will be that an association will be formed of the cowkeepers and dairymen of the three towns. Over 100 cowkeepers were present. The remarks in the "Notes in the West" are, to say the least, unfair, such play upon words not always having the desired effect, and adding insult to injury. Two wrongs will not make a right, but I have no doubt that the average of honest men amongst cowkeepers will compare favourably with those to be found even amongst journalists.

Apologising for occupying so much of your valuable space.

W. SAYER, Cowkeeper,

(*Chairman of Meeting.*)

James Street, Plymouth, *July 20th*, 1877.

SIR,—A very curious circumstance appears to have occured that, to say the least of it, is highly diverting and amusing. The harassed and injured dairymen of Stonehouse and Devonport select a cow, one of their number milks this cow (it is said in the presence of a police-constable), and two samples of milk are sent to two different analysts—Dr. Oxland and myself. In due time the certificates of the analysts come down, *each agreeing* that nearly the whole of the cream has been abstracted, and immediately a jubilant Plymouth cowkeeper rushes into print, raises the price of his creamless milk, and gives his own version of the transaction.

Unfortunately for the experiment the trick is at once too palpable, and has been carried too far. If a little less of the cream had been removed, the public, as well as the policeman, might have been imposed upon.

In this instance, as the mean of two very careful analyses, I returned the milk as containing ·2 per cent. of fat, which equals 1 per cent. of cream.

Thousands of analyses have shown that if the milk from all the cows in England was mixed together, the Analyst would obtain from a fair sample about 3 per cent of fat. No cow in health, either abroad or at home, ever produced milk, when fairly milked, with so small a percentage of cream as was sent to me. I say when fairly milked, for I am perfectly aware of the dodges of cowkeepers, and I know very well that a milkman can if he choses, by selecting certain portions, produce samples of milk with a somewhat low percentage of cream, such selected portions never being found in commerce, for I think the whole milking is mixed together.

I will buy any cow, certified to be in perfect health and properly fed, which when milked by me or in my presence, gives less than ·2 per cent. of fat, and shew it as a curiosity.

It is almost difficult to treat the matter seriously; but if the dairymen of Stonehouse really desired experiments to be instituted upon the amount of cream their cows produced before they advanced the price of their milk, the experimental cow should certainly have been pronounced healthy by a competent veterinary surgeon, and, above all, should have been milked by some intelligent, uninterested person. As the matter stands, the whole affair wears the aspect of a conspiracy. I assert that (1) the milk was deliberately and intentionally skimmed, or (2) the milk sent was from certain selected portions of the whole milking, or (3) that the cow was diseased.

I am, yours truly,

A. WYNTER BLYTH.

Barnstaple, *July* 23*rd*, 1877.

SIR,—A letter in your paper of to-day is another specimen of "If you have no case bully the witnesses." I will not attempt to add anything to my former letter. Dr. Blyth insinuates that it may or may not be true that the cow was milked in the presence of a police sergeant. Had the man been a constable of a brief experience, as such he might even then have hesitated to question the performance of his duty faithfully, but he is an experienced member of the Plymouth Force, of twenty years' standing, and hence he may well feel insulted at the statement made, Sergeant Monkley would not risk his reputation for the sake of the cowkeepers or any body of men. He certifies as follows:—

"I hereby certify that I went by direction of Mr. Superintendent Wreford to Mr. Sayer's field, saw a cow milked, filled three bottles with said milk, and prior to the cow being milked saw the bucket and bottles wiped perfectly dry. I also sealed the bottles, and they did not go out of my sight during my filling and sealing them with the Plymouth constabulary seal.—(Signed) RICHARD MONKLEY."

Dr. Blyth says, "the trick is at once too palpable, and had been carried too far. If a little less of the cream had been removed, the public, as well as the policeman might have been imposed upon." I will not venture to comment on this, but leave the certificate of the police-sergeant to answer such an attempt to evade the matter, and make my former letter a lie. I here most emphatically deny that the milk from the cow was in any way tempered with. The public will be able to judge between the statements of the police-sergeant and Dr. Blyth.

I assert that there has been no attempt at "conspiracy," but on hearing that the Stonehouse dairyman had been fined, and knowing the questions put by a Stonehouse dairyman, I was desirous of ascertaining for myself, and getting the milk from my cow. I quite thought that to apply to Mr. Superintendent Wreford, of the Plymouth police, would be as good a course as possible to pursue, seeing that the superintendent of Stonehouse police was the prosecutor in the Stonehouse cases. Dr. Blyth says, "The cow should have been milked by an experienced and disinterested person." The man was both. He had no knowledge of the sergeant's coming, nor, until the bottles were filled, did he know for what purpose the milk was obtained. Mr. Endle, veterinary surgeon, has professionally seen the cow to-day, and certifies that the cow is perfectly healthy, and has been so for some time past.

Yours truly,

4, James Street, Plymouth, July 26th, 1877. W. SAYER.

TEA HAIR.

By Thomas Greenish, F.C.S., London.

Read before the Pharmaceutical Conference at Plymouth.

The author said it appeared that tea hair found its way into this country as an article of legitimate commerce at tolerable regular intervals. Its commercial name was "Pekoe Flower," and sometimes "Bloom of the Pekoe Flower." It was a product of Indian teas, not of those of China. It was purchased somewhat as a curiosity, but some bought it regularly. It was never sold as tea simply, or for mixing with tea for sale; it was almost a necessary that it should be sold alone, for if it were mixed with ordinary tea it had such a tendency to separate and agglomerate into lumps, that any attempt of this kind would most probably result in the whole being returned as an adulterated tea.

In an essay on the cultivation and manufacture of Indian teas by Lieutenant-Colonel Money, published in Calcutta, the whole process of the manufacture of the Indian Teas was given, and it was not difficult to trace to its cause the condition in which this tea hair was found in commerce. One part of the process consisted in what was called "rolling" the leaves, when the juice was given out freely; and as to its results on the leaf and its hairs, Money says "If the leaves which give Pekoe tips are separated from the other leaves and rolled very little and very lightly, there will come out Pekoe tips of a whitish colour; if not separated from the other leaves, but manufactured with them, the sap from the other leaves expressed in the rolling, stains those said leaves which are covered with a fine silky down, and makes them look like the rest of the tea." This was evidently the part of the process in the manufacture of Indian teas which gave to the otherwise greyish white hair its brown colour, and also that extractive matter which was found adhering to it.

Wigner, in his analysis of the tea hair, gave theine 1·5 per cent., as compared with 3·5 per cent. for Pekoe tea, and Mr. Groves remarked in reference to this that "it was interesting to find theine present in the tea hair." The author doubted the correctness of this conclusion, and by several qualitative experiments satisfied himself that the theine found by Wigner was derived, not from the tea hairs, but from the extractive adhering to them.

ANALYST'S REPORT.

The report of Mr. W. L. Scott, analyst for North Staffordshire, was presented to the Board. It stated that 270 samples of food had been analysed by him, and most of the articles had been found to be more or less adulterated. He did not advise prosecutions, except in the worst cases, until the laws had become better known. He would have to recommend, subject to the approval of the clerk of the peace, several prosecutions, two of them being for the sale of adulterated spirits.

In a letter received subsequently, Mr. Scott said that it would be necessary that in future 250 samples should be submitted to him every quarter, and if the food inspectors did not receive instructions to make the purchases it was hopeless to attempt the improvement of the food products.

Mr. Gilbertson said that during the first three quarters of a year after his appointment Mr. Scott did nothing, and it was a question whether he was entitled to anything except for the last quarter, during which period he is said to have made analyses, but he had not furnished the usual certificates.

The Chairman said that the analyst himself appointed the food inspectors, and directed them to procure samples. The Act of Parliament directed that the medical officer of health, inspector of nuisances, or weights and measures, under the direction and at the cost of the local authority appointing him, should procure samples and submit them to the analyst. It also laid down that the analyst should receive payment and give a certificate. The analyst had induced the officer without the consent of Colonel Lindsay, to send him samples, and had now asked for payment, no doubt before the analysis had really taken place. He (the chairman) thought the samples were improperly obtained, as Mr. Scott had no business to direct the officers to do what they had. It seemed to be a case of over zeal on the part of a gentleman who was paid by fees. He (the chairman) would, therefore, propose that the clerk of the peace communicate with the analyst, desiring him to confine himself to samples sent by public officers, and not in future to give them any orders to procure samples for analysis. He would also move that in cases in which proceedings were directed Colonel Lindsay be requested to lay down the regulations for the conduct of the prosecutions. As Mr. Scott chose to play such a prank he thought he ought to be made to wait for his money until October.

After some discussion it was resolved to pay the public analyst his salary and £100 on account of his bill of fees.—*Western Mail.*

Mr. W. L. Scott has resigned his situation as analyst for the northern division of the county of Stafford.

LAW REPORTS.

Adulterated Soda-water.—The Cambridge magistrates have inflicted a fine of £5 upon Mr. John Yeomans, a chemist in that borough, for selling adulterated soda-water. The public analyst (Mr. Apjohn) certified that the samples he analysed contained no sodium bicarbonate, but 0·16 grains of copper in the gallon, and also a minute quantity of lead. In his opinion soda-water containing this quantity of copper and lead was injurious to health. Defendant said he was very careful in his manufactory; the vessels were tin-lined so as to avoid contamination, and he did not know how the copper got in. As to the absence of soda, the people did not require a soapy compound, and he made some of the water with and some without soda, to suit their requirements. It was pointed out that defendant should not have sold the article for soda-water.

Curious Adulteration.—Charles Frampton was summoned under the Adulteration of Food Act for selling an article of food called oatmeal, which contained a mixture of 30 to 40 per cent. of *wheat* flour and barley meal. Defendant pleaded guilty, and stated that he sold it in the same state as he received it from the manufacturer. Fined £1 and costs.

Castor Oil Pills.—At the Christchurch Petty Sessions on July 30, before the Hon. R. Douglas and six other magistrates, Alexander Duncan, chemist and druggist, of Commercial Road, and Lansdowne Crescent, Bournemouth, was summoned for having unlawfully sold a certain drug which was not of the nature, substance, and quality of the article asked for, to wit, castor oil pills, to the prejudice of the purchaser. The defendant pleaded not guilty.

Superintendent White, said that on June 22, he went to Duncan's branch shop at Lansdowne, and asked for a shilling's worth of castor oil pills, he was served with a box containing a number of pills, for which he paid a shilling. He then told the assistant that he was going to send them to the public analyst to be analysed, and offered to divide them. The assistant said it was not necessary. The same day he sent them to Mr. Arthur Angell, the county analyst, and on July 1, he received a certificate from him. The certificate stated that in the analyst's opinion the sample of pills contained rhubarb, aloes, peppermint oil, and soap, and that the application of the term castor oil to these pills was a dangerous practice, and might be attended with injurious results by leading the purchaser to understand that the active ingredient of the pills was castor oil.

Mr. Lacey addressed the Bench on behalf of the defendant. The very gist of the offence,

be observed, was that it should be "to the prejudice of the purchaser," and it could not be said that the purchaser had been prejudiced in this case. These pills had been known to the public and to the medical and chemical profession for several years as castor oil pills, and it had been universally the custom to call them so. The pills in question were very much more valuable than pills made of castor oil would be; but only one grain of castor oil could be contained in one pill, so that it would take from 200 to 400 pills for one dose. The custom originated at Bournemouth, through people who desired a mild aperient asking for castor oil pills, and being supplied with something very much better. This could not be to the prejudice of the purchaser.

The Chairman said it was argued in the gin case that the purchaser was not prejudiced by having 27 per cent. of water mixed with the gin, as the weaker the dilution the less harm it would do him, but the Bench ruled that the purchaser was entitled to have what he asked for. Mr. Lacey said this case was different. There was no castor oil at all in the pills. The Chairman: This is the case of a purchaser asking for one thing and getting another. Mr. Lacey: Which was better than the thing he asked for.

Mr. Lacey then called the defendant, who said—The pills in question are a compound of rhubarb, aloes, myrrh, soap, peppermint, and treacle, and are the mildest aperient mentioned in the Pharmacopœia, and safe for the most delicate constitution. I have heard of these pills being sold as castor oil pills, and I believe that people know them as such. I myself have never sold them under that name, but I know that it is the custom to do so. Pills made of castor oil would be dangerous if relied upon for the ordinary action of castor oil, as an ordinary dose would have no effect. A serviceable dose would be two tablespoonfuls or 600 pills. He was* in the habit of selling these pills as compound rhubarb pills. He believe it had been the custom for many years to sell them as castor oil pills. In reply to questions, the defendant said there was no nitre in sweet spirit of nitre, nor any hartshorn in spirits of hartshorn, nor any cream in cold cream. All these names are well understood to be misnomers.

Mr. Green, chemist, of Christchurch, said he had been in the habit for 25 or 30 years of selling a mild aperient—generally compound rhubarb pills—as castor oil pills, by which name people asked for them. He had done this in four or five counties in which he had lived. The action of compound rhubarb pills was similar to that of castor oil, but not quite so quick. I believe these pills were so named in consequence of some proprietor of patent medicines, bringing out pills under the name of castor oil pills. Gradually the public came to ask for them in small quantities, and it had been the custom in all parts of England to sell, under that name, such pills as those supplied in this case. The pills described in the certificate would be more expensive than pills made of castor oil would be. He also said that Vinegar-of-four-thieves does not really contain thieves. Epsom salts were not made at Epsom, but in the North of England, and there were no violets in violet powder, nor was Dragon's blood procured from the dragon.

Mr. Robert Chipperfield, chemist and druggist, of Southampton gave similar evidence, and said there were many instances of mis-leading names given to the articles by the public, but he did not know that they were bound to educate every one who came to their shops and tell him the composition of these articles.

In delivering the decision of the Bench, the Chairman said the evidence which had been given for the defence did not touch the fact that Mr. White had asked for one thing and been served with another, but only had shown the existance of a custom in the trade which they admitted as evidence in mitigation. It was a singular custom, however, and the sooner it was left off the better. It would be much better when the public asked for castor oil pills to tell them, "There are no such pills in the trade, but we can give you something which will answer the purpose as well." At all events the intention of the Act was perfectly clear—to give the public a right to have what they ask for, or be told that they could not get it. The penalty they should inflict was a very light one, because they thought it quite probable that the chemist in this case acted in good faith and was not aware of the law as it existed. They fined the defendant 1s. and 19s. 6d. costs.

NOTES OF THE MONTH.

The opponents of the Sale of Food and Drugs' Act, 1875, who seem determined never to lack reasons for adulterating, or excuses for adulteration when it has been committed, induced Mr. Isaac, at the fag end of the session, to bring a short bill into the House of Commons for the purpose of making an alteration in the above Act, and if it had not been for careful watchfulness on the part of the hon. member for the University of Glasgow, Dr. Cameron, there would have been a fair chance of the bill passing through

the Commons and going up to the Lords. The Bill itself was short but none the less objectionable. It was to the following effect:—

A Bill to Amend "The Sale of Food and Drugs' Act, 1875."

Whereas doubts have arisen with respect to the interpretation of 38 & 39 Vict. cap. 63, sec. 6 (Sale of Food and Drugs' Act, 1875):

Be it therefore enacted by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:

1. In determining whether an offence has been committed under sec. 6 of 38 and 39 Vict., cap. 63 by selling to the prejudice of the purchaser, whether wholesale or retail, spirits reduced by the admixture of water, regard shall be had, not only to the extent of such admixture, but also to the price at which the spirits so reduced are sold.

It will be seen that if it had passed into law the difficulties of public analysts would have been increased to a great extent, as they would have had to judge as to the value of the spirits at the place where they were sold; in fact, putting it in plain language, they would have had to judge whether Martell's brandy and Hennessy's whisky were each worth the price at which they were sold, and would have been placed in the unenviable position of being judges of quality as well as of purity. There would probably have been but little chance of the Bill reaching even so advanced a stage as it did, but that the Government wanted to make a few slight amendments in the Sale of Food and Drugs' Act, in order to bring the latter more in accordance with one or two peculiar enactments which appear to prevail in Ireland, and consequently they added a a clause to Mr. Isaac's Bill, and so made it to some extent a Government measure.

We should have thought the decision of the High Court of Justice in the case of Webb *v.* Knight* was sufficient to settle the point as to diluted gin, but it appears the trade thought it was not so, and therefore the thanks of analysts are due to Dr. Cameron for having so promptly defeated this measure. It is probable it will be brought in again next year, and if so it will have to be fought more vigorously, as it will no doubt be introduced earlier in the session.

Castor Oil Pills have been in the Law Courts again, and we reprint on another page a report of the case. As might have been expected, the trade journals are annoyed at the matter, but we cannot see what they can possibly have to complain of. Compound rhubarb pills are good in their way, but why should they not be sold under that name instead of under a fictitious one. No doubt, as one of the trade journals puts it, the public do not require to be told, without chemical analysis, that a bucket full of castor oil cannot be contained in a box full of pills, but no one says the public do—what the chemists are prosecuted for, is for selling as castor oil pills, pills which not only do not contain a trace of castor oil, but are in fact a totally different article.

We dare assert that the majority of the public when purchasing these pills, believe, unless they are told to the contrary, that they *do* contain castor oil, and we see no reason why every chemist should not act as other tradesmen do when they are asked for something they do not sell, and at once say so, leaving the customer to please himself about

* *Analyst*, Vol. 2, page 63.

taking something else, which the chemist may recommend as equally good or better. We should like to know what a chemist does when he is asked for compound rhubarb pills.

We agree with one of the witnesses that it is not a chemist's duty to educate the public, but that applies both ways, and if chemists have thought it their duty to educate the public to believe, as without doubt they have, that castor oil pills contain castor oil, we are strongly of opinion that it is their duty, and cannot see how they can object, to educate them back again.

A well known champion of druggists has come to the fore to defend the sale of castor oil pills, *i.e.*, these compound rhubarb pills. He estimates, that it would require 438 castor oil pills to make one dose if they really did contain any castor oil, but apprehends that scarcely anyone out of a lunatic asylum would imagine they did contain any. We may safely leave *him* to go on apprehending what lunatics may imagine, but we shall certainly have to enquire as to the sanity of one of our inspectors, for he thought the pills contained oil, and bought a box the other day. Our friend enquires whether druggists will be liable to penalties for selling "cold cream," and "violet powder," which are also misnomers. The simplest mode would be for him to purchase a sample and take it to the Public Analyst of the district, and if he receives a certificate of adulteration, prosecute on it, he will then obtain a legal decision.

We re-print on another page some correspondence from the *Western Morning News*. relating to a sample of milk which has recently been analysed by Mr. A. Wynter Blyth, the Public Analyst for Barnstaple. It will be seen that the sample was taken to Mr. Blyth as a catch, and that the statements on the part of the milk dealers avoid making any reference to the condition of the cow, or as to whether she was fully milked and yielded a fair quantity. Samples of the milk itself have been handed to us for independent examination, and we have certainly never met with a cow yet which yielded milk containing so little fat. In view of this Mr. Blyth's certificate appears to us to be quite correct. He does not assert that the milk "had been skimmed," but only that it had been "almost entirely deprived of its cream." Now it is obvious that there are three ways in which this may be done, namely, 1st, skimming, 2nd, stripping, 3rd, disease. In any one of these three cases the sale of such milk would constitute an offence against the sale of Food and Drugs' Act. Milk certainly means *whole* milk, *i.e.* the entire produce derived from the cow, clearly therefore either skimming, properly so called, or "stripping," *i.e.* partial milking of the cow, constitute offences against the Act, since they both separate the milk into two portions, one containing an excess of fatty matter and one a deficiency. Clearly also the milk of a diseased cow is not of the "nature, substance, and quality," proper, to be sold under the name of milk. There has been more than one conviction already for such an offence. If the milksellers really meant to act in a bonâ fide way, why did they not have the cow examined by and milked in the presence of a veterinary surgeon. If for the sake of extra profit a milkman half starves a cow till he produces disease, we hold that if he sells the milk of that cow as genuine milk, he is justly liable to conviction under the Act.

CAPSAICIN—THE ACTIVE PRINCIPLE OF CAYENNE PEPPER.

By J. C. Thresh, F.C.S.

Read before the Pharmaceutical Conference—abstracted by the Author.

By acting upon 30lbs of pepper, the author hoped to obtain a sufficient quantity of capsaicin to admit of its thorough chemical investigation, but in this he was disappointed, as only from 3 to 4 drams of the slightly impure principle was isolated.

The pepper was first exhausted with spirits, and the spirits removed by distillation. The residue weighed 8½lbs. This was treated with benzine, and the fats left upon evaporation of the benzine solution, dissolved in a little warm petroleum. The solution after a few days deposited a very large quantity of a fatty acid, which when separated and purified, exhibited all the properties of palmitic acid. From the filtered petroleum the capsaicin was removed by repeated treatment with spirits of wine, and about 1 dram of perfectly pure crystalline principle, obtained by crystallization from ether.

Burnt with lead chromate ·356 grams, gave ·9105 CO_2, and ·2995 H_2O; ·38 grams gave ·9745 CO_2 and ·318 H_2O.

These results agree closely with the formula $C_9 H_{14} O_2$, obtained by Dr. Buri, from a sample of capsaicin, prepared by the author from Natal pepper. By oxidation with nitric acid, oxalic and succinic acids are formed, together with a crystalline, and an oily substance, as yet unexamined.

Capsaicin appears to form more than one substitution product when treated with chlorine, and forms crystalline compounds with the metals, calcium, barium, and mercury.

RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Southampton Row, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
4652	E. G. Brewer	Centrifugal Drying Machines or Extractors	6d.
4765	W. Morgan Brown	Electric Telephony	1/4
4905	S. A. Varley	Apparatus for Producing Electric Light	10d.
4999	J. B. Kunkel	Eliminating Phosphorus from Iron	2d.
5001	J. Hargreaves	Apparatus for Manufacture of Chlorine	6d.
5055	W. E. Gedge	Manufacture of Hydrocarburets of Coal Tar, &c. ...	4d.
5061	C. and A. Forrest	Drying and Powdering Blood, &c.	6d.
1877.			
27	W. R. Lake	Apparatus for Testing Milk	2d.
77	E. Solvay	Manufacture of Chlorine	4d.
97	T. A. Collinge & T. O. Paterson	Purifying Coal Gas	6d.
121	P. Dronier	Lighting Gas by Electricity	2d.
169	J. G. Tongue	Obtaining Colouring Matter from Coal	2d.
190	J. H. Johnson	Treating Saccharine Juices	4d.
263	J. Honzean E. Devedeix and J. Holden	Purifying Sewage	4d.
272	R. W. Wallace & C. F. Clans...	Purification of Gas and Utilization of Bye Products ...	4d.
457	W. Moody	Manufacture of Hyposulphite of Soda, &c.	4d.
1374	F. Lecourt & A. Guillemare ...	Manufacture and Application of Chlorophylle	4d.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The American Chemist; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Telegraphic Review; The Medical Record; The Geological Society's *Proceedings; The Miller*; The Anti-Adulteration Review

THE ANALYST.

ORGANIZATION AMONGST CHEMISTS.

We are not surprised that the article which we published last month under the above heading should have called forth remarks on the part of two of our contemporaries, namely the *Chemical News*, and the *Pharmaceutical Journal.* We took some pains to point out in that article certain defects, which appeared to us to be self-evident in the organization scheme as at present proposed, and our remarks naturally invited comment or assent.

The *Chemical News* of the 14th September, devotes a column to the consideration of the subject, and except that the article does not go far enough, we agree with nearly all that it says. The main point to which it draws attention is the fact that certain persons are—or a certain person is—offering by means of circular or letter to perform commercial analyses for ridiculously low sums; we know this is so, and the circular referred to is before us, and we quite agree that if analytical chemistry is to be practised upon such terms, "stone-breaking is of the two the more respectable profession." But on two points we differ from the *Chemical News.* We do not think it is one or two men only who are guilty of this kind of unprofessional and *unbusiness-like* conduct. On the contrary, we fear that it is a much larger number of men, some of whom occupy a respectable position in chemical society, who in order to fill up their so-called spare time, or more likely to *utilize* according to their own views the services of some one or two of their pupils are working at these low rates; therefore we again differ from the *Chemical News,* in that we think that the Institute of Chemistry, as at present proposed, will do nothing whatever to remedy this grievance, if indeed a grievance it be: because among the Committee of the Institute of Chemistry itself are, if our correspondents inform us correctly, some of the most notoriously under-bidding men in the profession. Besides the *advertisements* from other members of the Committee to which we have already from time to time referred, we have as we write one lying before us, offering *to analyse starches or arrowroots, for the modest sum of half-a-crown.* The other charges are correspondingly moderate. It is hardly likely, that while the *heads* of the profession, as we suppose we must assume the members of the Committee consider themselves to be, do such things as these, the *men* whom they are going to organize will do much better.

The article in the *Pharmaceutical Journal* is a singular one. We wish we could stop at singular, but it mis-quotes us. The *Pharmaceutical Journal* says, "The Analyst "grants that the Committee of fifty, which had the care of the child institute, was "an able body, the most clever, the most competent, and most successful chemists in "the country." The Analyst granted nothing of the kind; on the contrary, the words which we used were, "nevertheless these 'private' 'general' meetings have been held, and "the gentlemen attending them have appointed a Committee of some fifty of their "*friends* to carry the scheme through—mistake again. These fifty may be, and perhaps "are the fifty most clever, most competent, and most successful chemists in the country." The sentence did not need to be looked at twice to be seen that our meaning has been perverted. However, to make it perfectly clear and unmistakeable, we *do not think* that these fifty are "the most clever, the most competent, and most successful chemists in the "country;" on the contrary, we think that the selection was in many cases an unwise one.

Now having referred to a mis-statement which we are sure our contemporary will regret, we will proceed to deal with the other points in the article, and also with some further points relating to the Institute itself.

The *Pharmaceutical Journal* calls the article which we wrote on the subject, a "funny article." It is hard to conceive of a worse description; we were writing seriously, and there was nothing which could possibly justify such a remark. It also objects to our definition of Professional Chemists, because it thinks that we are wrong in putting in the words, "purely by the practice of Professional Chemistry, as distinct "from Pharmacy." We put them in advisedly, and we adhere to them. If this organization is to be, or is to do anything at all, it must appear at once in its proper light, and that light, call it what they may, is simply and solely that of a Trades Union. Now it would be absurd to talk of a Trades Union embracing both civil engineers and machine makers, and equally absurd of one embracing both professional chemists and pharmacists, and still worse to speak of one embracing professional chemists, pharmacists, and scientific amateurs; therefore we say that the members must be limited strictly to those who earn an income by Professional Chemistry, as distinct from Pharmacy, and if the *Pharmaceutical Journal* would wish us to add it, from every other branch of scientific or semi-scientific work. The remark that there is hardly a man in all England who earns an income purely by the practice of Professional Chemistry is feeble, and most probably there has been a printer's mistake here, and the writer meant to say that there are but few men on the Institute Committee who earn an income by Professional Chemistry, because we could point without difficulty to a dozen men who have not been invited to, or admitted to any of the conclaves of this body, who are not only earning an income, but a comfortable living, by Professional Chemistry only.

The "Public Analysts—well, only Public Analysts," of whom the *Pharmaceutical Journal* talks, are an almost extinct race. There is no doubt that at first when the Adulteration of Food Act came into operation, a large number of men possessing no higher qualifications for the position than the fact that they were medical officers, or chemists and druggists in the town where they lived, did happen to be elected as Public Analysts, but experience in the working of the Sale of Food and Drugs' Act has amended all this, and no further appointments of this kind can now be made, and even those few who had accepted the office and its responsibilities under the old Act are beginning to find out that the best thing they can do is to resign their appointments, and leave Professional Chemists to carry on the work which properly belongs to them. But those who remain are certainly entitled to claim admission to any organization.

Now leaving the question of the article in the *Pharmaceutical Journal* itself alone, we come to the views which it puts forward, evidently as the views of the promoters of the Institute of Chemistry. It says that we are apparently unacquainted with the just and proper means which will be adopted in order to cause a just appreciation of merits and qualifications. We certainly admit that we are so; but while admitting our ignorance on the point, we must say emphatically that there are no means which can infallibly be used to ensure this "just appreciation." We know, for instance, of one man in good and successful practice who only analyses one single commercial product, and on that product he is probably the best and most reliable authority in England; at any rate he has had the credit of carrying on a practice solely in connection with this *staple* article of manufacture for years, and supporting himself by his work; in fact,

earning a living by Professional Chemistry as distinct from Pharmacy. How would it be possible for any of the promoters of the Institute to judge as to his merits and qualifications, when his attention has been directed solely to an article in reference to which they are themselves profoundly ignorant! We know at least three other men, all of them with practices of the largest character, whose business is simply and solely Consulting Chemistry in its reference to chemical manufacture; men who in fact spend the entire of their time in visiting chemical works, and consulting with different manufacturers, and advising them as to the most desirable mode of working, so as to achieve the greatest economy in their factories. These men stand alone in the profession, and we believe that not one of them is included in the Institute. Who then is to judge as to their capacity? And again we may have one more class, and we think this class should certainly be included, the class of chemists and assistants in iron works, chemical factories, and manure factories, each of whom, in his own line, acquires an amount of knowledge and ability quite sufficient to justify the claim to admission to the Institute; but ability of such a kind, that no Committee could fairly or fully comprehend it, unless some of the class were included. The whole thing virtually sums itself up into this. There is only one way in which the Institute can be formed to become a success, and that is, as we and our correspondents have repeatedly urged, to call a public meeting of every professional chemist in England, and let them elect their own Committee, and without any hesitation, we say that the Committee who would be elected would be different from those who form the present body. Apparently at present, the object of the promoters has been to include the names of a host of their personal friends, the "nobodies" whom the *Pharmaceutical Journal* refers to, in order to gain all the power that they possibly could in the balloting for or election of "the gentlemen who pursue science as a profession," and earn *a living* by it, but who have not yet been invited to come among them. We somehow think it will be a long time before they will have to exercise their balloting powers.

In conclusion, we repeat what we have said all along, that an organization founded on the private meetings of a clique sitting with closed doors, will never be acceptable to the mass of Professional Chemists throughout England. Let therefore the present Committee fairly and openly call a public meeting of the analytical chemists of the country by public advertisement, and laying the proposed scheme before them, invite them all to join and assist in forming the Institute, and in electing a council, and all will go well. If the Committee really has the interests of the whole profession at heart, as distinct from private aggrandisement, and an endeavour to injure some of their present successful competitors, they will at once accede to our proposition. If not, then the latent spirit of the promoters of the present scheme will shine forth in all its true colours, as intended simply for the benefit and glorification of the few, at the expense of the many.

NOTE ON THE DETECTION OF STRYCHNINE.

By Alfred H. Allen, F.C.S.

Read at the Meeting of the Society of Public Analysts, Plymouth, on the 17*th August*, 1877.

In my practice I have had a great variety of animals submitted to me to be tested for poison. The number of cases in which strychnine has been found is probably greater than that all other cases put together, and as I find some chemists profess a difficulty in

applying the tests for strychnine, I believe I may do a service by publishing my method of procedure, though it has no claim to novelty, except, perhaps, in one or two details.

The matter to be tested is, first of all, digested on the water-bath with water and some acetic acid. Alcohol is next added in sufficient amount to facilitate the filtration of the liquid. The filtered liquid is evaporated nearly to dryness, water again added, and the solution filtered. The clear liquid is again evaporated to a syrup, strong alcohol added, and the liquid once more passed through a filter. The alcoholic solution is evaporated, the residue taken up with a small quantity of water, the solution filtered, if necessary, and treated with soda in moderate excess. The alkaline liquid is next shaken with ether, the etherial layer removed with a pipette and allowed to fall—one drop at a time—into a porcelain basin, heated by hot water. In this manner the strychnine is concentrated in a comparatively small space, instead of being spread out over a large surface. When the ether has all evaporated and the basin become cool, the residue is treated with concentrated sulphuric acid.*

There is considerable choice in the oxidising agent employed. Bichromate of potassium is decidedly the worst, in my opinion, of all those commonly used. Dioxide of lead is not very satisfactory. Powdered ferricyanide of potassium gives a very good result, but requires to be used carefully. Finely powdered dioxide of manganese gives the best results in my hands. It should be added to the sulphuric acid in moderate amount, so as not to obscure the violet coloration, and the mixture should be well stirred. The changes of color occur much less rapidly with the manganese dioxide than with ferricyanide. This is in some cases an advantage.

I have sometimes used dialysis for the original extraction of the strychnine, but as the aqueous liquid requires to be subsequently treated in much the same manner as already described, the loss of time involved is seldom accompanied by any compensating advantage.

Dr. Muter said he had found that the agitation of the acid solution of the strychnine with ether, to remove indifferent matters, greatly facilitated the subsequent purification of the strychnine.

Mr. Thomson had obtained good results by preparing chromate of strychnine, and subsequently treating that salt with sulphuric acid.

AN EASY AND RAPID METHOD OF MANIPULATING "FATTY ACIDS."

By A. Wynter Blyth, F.C.S.

Read before the Society of Public Analysts, at Plymouth, 17th August, 1877.

I use an apparatus, the principle of which has long been known to chemists, and indeed a small flask similar to the one I am about to describe is figured in "Mohr's Toxicologie," being there recommended as convenient for the separation of the alkaloids by solvents.

My flask is between 300 and 400 c.c. capacity, its neck is rather long and narrow, and is furnished with an accurately fitting stopper, through which two tubes pass, one provided with a stop cock to let out the liquid, and therefore, of course, terminating on a level with the interior surface of the stopper, the other to let in the air, prolonged to nearly the bottom of the flask, and externally bent syphon-like.

* If any serious discoloration ensues, the basin should be heated on the water-bath for an hour or two to destroy foreign matters. The solution is then treated with water, filtered, again rendered alkaline, shaken with ether, the etherial layer evaporated to dryness and the residue re-treated with acid.

The fat is saponified in the flask, and the soap decomposed in the usual way, when this is effected, the stopper is inserted, and the flask is turned upside down and kept in that position during the entire washing process. Directly the whole of the fat has risen to the surface, the lower liquid is run off, whilst hot or cold water is introduced by opening the stopper under the water, and simultaneously sucking at the syphon. Thus all waiting for the fat to cool is discarded, any reasonable quantity of water can be rapidly used to thoroughly wash the fatty acids, and a filter is not required.

NOTES ON AN IMPURITY IN OXIDE OF ZINC.

By W. W. Stoddart, F.C.S., &c.

Read before the British Pharmaceutical Conference at Plymouth.

A few weeks ago I had a sample of oxide of zinc sent to me for analysis. It was bought for mixing with white lead as a paint, but on being ground was found to be nearly useless. It would not readily combine and form a homogeneous mass, as usual, nor would it give the "body" required. In fact it was so unsatisfactory an article that it was laid aside and another used in its stead. Some objection was raised to its being returned which caused the firm to have it examined, and the cause of failure ascertained.

I have brought the subject before your notice, not on account of the peculiar impurity, but because it has a pharmaceutical interest, for it answers well to all the pharmacopœial tests for pure oxide of zinc, and yet it is impure to the extent of nearly ten per cent. The sample was nearly white with a very slight buff tint. Like the pure oxide it became a strong yellow when heated, regaining its former whiteness when cold. It was perfectly and easily dissolved in an excess of carbonate of ammonia, and the alkaline hydrates. From the alkaline solution a white precipitate was produced by a sulphide of ammonium. It dissolved without effervescence in dilute nitric acid, and was so little affected by chloride of barium that after standing for several minutes, the milkiness was so slight as to require a close scrutiny for its recognition. If, however, the solution in nitric or hydrochloric acid be made in a flask, a strong odour and copious evolution of sulphurous acid gas becomes very evident. A few grains were placed in dilute hydrochloric acid with a small piece of pure zinc when sulphuretted hydrogen was evolved, and speedily became evident with the help of a bit of lead paper. The addition of chlorine water produced a distinct precipitate of sulphate with chloride of barium. The use of nitroprusside gave a red colour with a little of the solution to which a little soda and acetic acid had been added. An analysis showed that the sample was composed of oxide and sulphite of zinc in the following proportions:—

Oxide of zinc	90·87
Sulphite of zinc	9·13
Sulphate of zinc, a very slight trace.	
	100·00

The trace of sulphate was so small that it was probably due to oxidation of the sulphite. The cause of the presence of sulphite of zinc is not quite apparent, but the sample came from a continental house, and was very likely manufactured from a sulphide of zinc in some rapid and imperfect manner, which had partially oxidized some of the sulphide, and produced the impure product of which complaint had been made. The appearance of the sample suggested a process by heat rather than by precipitation.

ABSTRACT OF A SUPPLEMENTARY NOTE ON THE ASSAY OF OPIUM.

By S. B. Proctor.

Read before the Bristol Pharmaceutical Conference at Plymouth.

Since the publication of my former note on this subject, I have recorded two or three small matters which I now offer for your consideration.

The process as described at our last meeting was devised with the object of being at once accurate and speedy. With the view of further expediting the extraction, I have modified the mode of operating thus:—

Rub the lump opium with its own weight of water, to as smooth a pulp as possible, if necessary with the aid of a gentle heat; add spirit equal to about three times its weight and transfer to a percolator tube which is furnished with a loosely fitting inner tube closed at both ends for increasing the hydrostatic pressure.

A phial filled with water and corked answers well for the inner tube, a string being tied round the neck, by which it may be let down gently till the bottom of the phial just touches the surface of the opium liquor.

Its position may then be fixed by pressing the string between the side of the tube and a cork wedge. When thus arranged, more spirit may be added, till a column of 6 or 8 inches is obtained without disturbing the marc or mixing to any appreciable degree with the opium liquor, and without using more spirit than is required for the exhaustion of the opium.

In one experiment with 200 grains of a soft sample of Turkey opium treated thus, a head of 8 inches pressure was obtained. In four hours, four ounces of percolate had passed through, which contained 98 per cent. of the morphia present; another ounce was considered to have effected practically a perfect exhaustion. Other trials gave similar results.

I have occasionally met with specimens, which deposited along with the morphia, a white amorphous substance which could be washed out only by long continued washing with spirit, strong or dilute.

These specimens I have assayed by the lime process, and by the acetate of lead process (in conjunction with the above mode of extracting), but without quite satisfactory results.

Upon the whole, I find it most advantageous to cut the washing short when I find such impurity present, dry the precipitate, wash out the narcotine with benzine as usual, and then re-dissolve with hydrochloric acid and spirit, and reprecipitate with ammonia, which treatment I have never found fail to give me well-crystallized, and nearly white morphia of almost absolute purity. If the quantity of spirit and water used for solution be limited to two drachms of each, (the quantity I find desirable for an operation upon 100 grains of opium), and the washing be not unnecessarily prolonged, one-quarter-grain may be allowed for the loss in purification. I find the solution by spirit and acid followed by reprecipitation is both more convenient and less wasteful than crystallization from boiling alcohol, which has been recommended by some analysts; and I find the loss of time is not necessarily great, for the morphia goes down with more promptness and certainty from this approximately pure solution than when deposited from a liquor containing the soluble extractive matters of the opium. Three to four hours are sufficient in the former case, while eighteen to twenty are desirable in the latter.

I have found in sundry cases that the precipitation of the morphia from solution in *strong* spirit and acid is advantageous, inasmuch as the crystals are whiter, larger, and sooner washed clean, but my experience is too limited yet, to say whether the strong spirit is generally preferable. When rectified spirit is used without water, for the solution from which the morphia is to be precipitated, a larger correction must be made for the quantity of morphia retained in the mother liquor.

Mr. Cleaver, regarded the washing water as a saturated solution of morphia, and quoted evidence in support of the supposition. I think it is safe after sundry experiments to assume that the loss of morphia in the mother liquor and washings when the process is performed as I have described, amounts to 0·2 to 0·25 grain.

Some analysts recommend the washing of the precipitated morphia with a small quantity of chloroform as well as with ether, benzine, or spirit. I have found the loss involved by its use to be very trifling, but I have limited its quantity to a fluid drachm or two, and in those cases where the washing with spirit and benzine did not readily remove the impurities, the chloroform also failed to do so unless used freely, and as its solvent action upon morphia is much greater that of ether or benzine, the estimation of morphia washed away by its use becomes more important, at the same time that it is more troublesome. 11·2 is the highest percentage of morphia I have found in Turkey opium in its fresh moist condition.

The percentage of water in moist opium I have found to vary from 19 per cent. to 27 per cent. Mr. Dott's table agrees closely with my observations in this particular, if we omit one anomalous sample which he found to contain 31·2 per cent. of water and yield only 20·1 per cent. of aqueous extract.

REVIEW.

A TREATISE ON CHEMISTRY.

By H. E. Roscoe, F.R.S., and C. Schorlemmer, F.R.S.,

Vol. 1.—*The Non-metallic Elements.*

A handsome 8vo. volume of 771 pages, well-printed, and beautifully illustrated, a book more for the drawing room, than for the study and the laboratory. It is a work of some pretensions, and coming as it does from two chemists, long and favourably known both as workers and teachers at one of our highest science schools, will probably have no inconsiderable influence on the teaching of chemistry in England. This influence we fear will not be a favourable one; among much that is commendable, its completeness, its full description of many fundamental experiments, the frequent employment of equations to express re-actions, &c., there is much that has to be condemned. The book abounds in loose and illogical writing, conclusions are drawn, which, though frequently correct in themselves, have no logical connexion with the premises from which they are supposed to be drawn, and thus the chief value, as an educational instrument, which can be claimed for science teaching, the training of the mind to exact logical reasoning, is lost.

The book opens with a short historical sketch based chiefly on the writings of Kopp. Next follow some chapters on general principles, well illustrating our above remarks. On page 43 we are told that a science may be called experimental as opposed to observational, "when we are able so to control and modify the conditions under which the phenomena occur as to produce results which are different from those which are

otherwise met with." Surely experiments are not merely, or even chiefly, for the purpose of producing results, not otherwise met with, but rather for the purpose of showing that certain phenomena are produced under such and such conditions, proving the correctness, or otherwise, of our observations or conclusions. On page 70, after a table giving the combination by volume of various elements, when in the gaseous condition we are told: "It is thus clear that *the number of atoms which is contained in a given volume of any gaseous body, must stand in a simple relation to that contained in the same volume of any other gas*," whereas all that is really clear, is that combination by volume usually takes place in very simple ratios, and this might well be, nay probably is, the case without the existence of atoms. Again, on page 71 we are told, "From this train of reasoning, it follows, that an atom is the smallest portion of matter which can enter into a chemical compound, whilst a molecule, on the other hand, is the smallest quantity of an element, or of a compound, which can exist in the free state." This is simply a definition of what chemists at present understand under the term atom and molecule, but does not by any means necessarily follow from "this train of reasoning." On the same page we find the following strange logic. After defining the use of symbols and explaining that by placing symbols of elements side by side, a combination of these elements is signified, we are informed, "hence it is clear that the atomic weight of a compound is the sum of the atomic weights of its component parts," this again is simply a statement of observed fact, although it would have been better to have put it, that the molecular weight of a compound, &c., &c., but no more follows from what precedes it than—well the ideas of the authors as to what is clear, clearly differ from ours. The whole of these chapters seem to be written by men who have not clearly grasped the subject, and are therefore unable to place it clearly and logically before the student.

The descriptive part begins on page 95, commencing with hydrogen. On the whole, this part is far better done than the first, but even here we find many instances of what we have called loose writing. To give a few examples merely. On page 177 the preparation of oxygen from barium peroxide is described, and we are then informed that "this simple method has not unfortunately come into general use, as the baryta looses its power of absorbing oxygen," &c., &c., the unfortunate thing being, not that the method has not come into the general use, but that the baryta looses its power of absorbing oxygen. On the same page it is stated that the mixture of caustic potash and lower oxides of manganese, produced by the action of steam on heated manganate, "when again heated absorbs oxygen," where from? On page 178, we find "certain metals also absorb oxygen when in a molten state, and give it off again on cooling," they give it off, like water, on *solidifying*. But we must hurry on, on page 713 we have, "This crystal," &c., &c., "must now be placed in such a position, that the edge whose angle of inclination has to be measured, is placed exactly in a line with the axis of the instrument." It should of course be, the intersection of the two planes, whose angle of inclination to each other is to be measured, must now be placed, &c., &c. It is also unnecessary to place the intersection or edge, exactly in a line with the axis of the instrument, which would be almost impossible to accomplish, but it is *necessary* to place it *parallel* with the axis, and nearly coincident with it, and this *can* readily be accomplished, although we are not told in this book how to do it.

The work is, as before observed, very complete, nevertheless some things are *omitted* which seem to us would have been worth mentioning. The preparation of

hydrogen by the action of sodium is described, but no hint is given that there is danger of explosion, and of course no directions are given for avoiding it. Among the properties of oxygen, no mention is made that it combines, at ordinary temperature, with binoxide of nitrogen, or that it is readily absorbed by alkaline pyrogallates, and various other substances. In some cases we come also across bad chemistry, as for example on page 410, where the action of nitric acid on metals is incorrectly given, it is the hydrogen and not the metal that reduces the acid. On page 650, very erroneous ideas respecting urea are put forward; urea is the predominating nitrogen compound in the urine of man, not in that of animals generally.

The printing is on the whole well done, though there are misprints in the book not mentioned in the table of errata. On page 128 the tension of hydrochloric and vapour at—10 is given incorrectly; page 146, line 9 from the bottom, hydroiodic is printed for hydrobromic; page 177, line 8 from bottom, we have manganese for manganate, &c.

In conclusion, we must express our sorrow that we have felt obliged thus to write of a work on which both authors and publisher have evidently expended much labour and capital, and we sincerely hope that future editions may be free from the blemishes we have thought it our duty to censure in this.

NOTE ON SEWAGE FARM MILK.

By John Shea, M.D., B.A.

Sewage farm fed cows appear to give milk of a high specific gravity. A sample of morning milk from seven or eight short-horned cows, fed chiefly on the rye grass from the farm, with a little "toppings," and maize, and permitted to graze for about an hour a day on ordinary grass land, gave the following result:—

Sp. G.	Cream per cent. by vol.	Total Solids.	Fat.	Solids not fat.	Ash.
1035	14	14·8	5·6	9·2	0·85

The milk is rich, but more remarkable for its weight than fat. All samples of milk from the cows fed on the farm have given results with high specific gravity, and large percentage of solids, but usually not over 4 to 4·5 per cent. of fat. The milk shows no undue tendency to early decomposition if kept. The sewage grass will occasionally "scour" the cows if they have too much of the rye grass.

TREATMENT OF ORES OF LEAD AND ZINC.

All metallurgists are familiar with the difficulties which have always been encountered in the attempt to treat these ores profitably, and immense masses of them have either been left altogether unworked or the waste portions have been thrown into heaps, encumbering the mines with useless deposits. The specific gravity of the different ores are too similar, and their union frequently too intimate, to admit of merely mechanical separation, and apparently up to the present time no efficient chemical means of separation seem to have been found, unless by processes involving so much expense as to make them unprofitable. In reference to the extraction of the zinc, there is not, of course much difficulty theoretically in separating it by distillation; but practically, the concentration of the lead remaining in the guangue has presented almost insuperable obstacles; while if it be attempted to separate the lead and reject the zinc, the zinc has a tendency

to form a hard scoria, not only retaining much lead, but also holding back much of the silver which ought to be taken up by the lead, so that the consequence is a greatly diminished yield of lead, and that which is obtained is less argentiferous.

Mr. Maxwell-Lyte, of Paris, has just published some processes which appear likely to remove a considerable amount of the dfficulty which has been experienced with these ores. It is impossible in the space at our disposal to enter into a detailed account of the methods which he proposes, but we may say that in the main they consist of a combination of the wet and dry methods. Thus, in one of the cases to which he refers the mixed ore is treated in the first instance with dilute hydrochloric acid hot, by which means the zinc and lead are both chloridized, the lead being more or less dissolved, the zinc entirely so; while on cooling the solution the chloride of lead is deposited, because of its relatively slight solubility in the cold liquid. The clear solution is poured back on to the residuary guangue from which it was decanted, and again heated and redecanted, when it carries over a fresh portion of lead. Thus the guangue, deprived of its lead as well as its zinc, may be thrown away. The silver also all passes over with the lead. The deposit of chloride of lead and silver is now reduced to a spongy metallic state by placing in the solution bars or lumps of metallic zinc, while all the zinc remains in solution, whether that contained in the ore or that which had dissolved in the process of reduction of the lead and silver. This spongy lead may be easily fused in a reverbatory furnace, and subsequently desilverized. The zinc from the decanted liquors is precipitated by lime, washed and pressed into bricks, forming a kind of artificial calamine, containing from 60 to 70 per cent. of metallic zinc, and is ready for treatment by distillation. In this way Mr. Maxwell-Lyte considers that he can extract from ores all the lead and silver, while the zinc is also recovered in an available form free from lead. Several alternative processes are also described, but the one of which we have sketched an outline shows his ideas.

SULPHUR IN GAS.

The vexed question of the amount of sulphur impurities to be allowed in gas, which for twelve months at least has been practically settled in London by the defeat of the two bills brought in by the Crystal Palace Gas Company and the Gas Light and Coke Company, has been raised at Maidstone, where the gas on two or three occasions appears to have contained from 35 to 45 grains of sulphur per 100 cubic feet; or, in other words, to have been in this respect as bad as absolutely unpurified gas. Complaints were naturally made on the subject, and the engineer of the Maidstone Gas Works presented a report to the directors of the company, containing some statements which, to those who are familiar with the evidence recently given before the select committees of the House of Commons, must appear to be of a most remarkable character. Thus, this gentleman says "the evidence given on that occasion by the chemists, who are alike the most eminent of the day and the most experienced in respect to coal gas, has gone to prove that a quantity of these compounds, up to about 35 or even 40 grains per 100 cubic feet, is not injurious to health; and that a partial removal is not worth the trouble and expense incurred." It is certainly somewhat singular that, if the evidence of these chemists did prove this fact, the select committee should nevertheless, *as reported* in our number for July, page 67, have thrown out both the bills, and there-

fore kept the companies still under restrictions in regard to sulphur compounds. There is no doubt that some evidence was given of the character alluded to in the engineer's report, but this evidence was so emphatically contradicted by chemical evidence on the other side that the committee had no other course before them but to reject the gas companies' proposals.

We purpose in our next number, if space allows, making further reference to this subject, with a special view to pointing out the character of the products which are produced during the combustion of ordinary coal gas containing sulphur. It is quite evident that such a paper is needed, not perhaps so much for the enlightenment of analysts as for the information of those quasi chemists who put themselves forward to advise public bodies on such points. Thus we find in this case an argument extending over some half column of letterpress to prove that 40 or 50 grains per 100 cubic feet cannot be injurious, because it only forms about 0·18 per cent. by weight of the gas which is burned, ignoring entirely the fact that this gas in its combustion produces at least three separate ingredients in considerable quantity, namely—water, carbonic acid, and sulphuric acid. What can any percentage composition possibly have to do with a case of this kind, where the injury is done solely by the sulphuric acid which is formed? Impure gas has nearly as much influence on the death rate as impure water.

SUGAR IN PHARMACY.

Dr. Symes read a paper before the recent *Pharmaceutical Conference* on this subject, and we extract from it the following useful table, showing the action which different acids exert upon solutions of cane sugar:—

Inverting Power of Acids on Sucrose.

(Arno Behr.)

Acid.	211 hours 13°—17° C.	115 hours 19°—27° C.	78 hours 25°—27° C.
Acetic Acid	1·2	1·3	1·6
Butyric "	—	1·9	2·5
Isobutyric "	—	2·2	2·6
Succinic "	—	3·5	4·0
Malic "	—	8·1	8·8
Citric "	8·2	9·2	10·2
Formic "	—	9·2	9·6
Lactic "	10·2	10·4	9·9
Tartaric "	11·4	13·4	13·8
Phosphoric "	24·2	25·8	26·9
Oxalic "	49·6	53·1	54·5
Sulphuric "	83·9	83·1	84·2
Hydrochloric "	100·0	100·0	100·0
Nitric "	100·1	100·4	100·1

The figures in the columns represent the inverting power of the acids upon cane sugar at various atmospheric temperatures and for various lengths of time. It will thus be seen that acetic acid has the lowest, and hydrochloric and nitric acids the greatest, inverting power, while phosphoric acid stands high in the scale. It is possible that this to some extent accounts for the difficulty which has been encountered in keeping all the compound phosphate syrups in a state fit for use.

Errata.—p. 98. In the last paragraph of Mr. Allen's paper on Alcohol in Ether and Chloroform, for "deducted" read "deduced."

MILK ANALYSIS.

The following refers to the correspondence we reprinted last month on this subject:

THE DAIRYMEN AND THE ANALYSTS.

To the Editor of the Exeter and Plymouth Gazette.

Sir,—Your leader of to day states; "We should very much like to know the name of the large town in the West of England" respecting the *Medical Examiner's* milk story, and I hasten to gratify such laudable curiosity, the more especially as on public grounds, it is highly desirable that there should be a complete exposure of the incident referred to.

After several milk prosecutions undertaken by the Stonehouse authorities, a private meeting of the Plymouth milkmen appears to have been held, and, whether as a result of the collective deliberative wisdom of the assembly, or of individual inspiration, the fact remains that the Chairman of the meeting, a Mr. Sayer, selected a cow and a constable, had the cow *partially* milked in the presence of the constable, and filled three bottles, one of which was sent to Dr. Robert Oxland, a second to me, and the third was at first retained by the police, but subsequently analysed by Mr. Wigner.

This milk, direct from the cow, was returned by the three analysts, and justly returned as adulterated. That is adulterated in the sense of the Sale of Food and Drugs Act. It was, indeed, almost destitute of cream, and the two first analysts *not knowing its history*, stated their belief that cream had been abstracted; the third analyst, Mr. Wigner, in full possession of the facts, certified—"It has unquestionably been deprived of part of its cream by skimming, or *by abnormal milking*."

It is well known, both to the milkman and the analyst, that the first portions of milk, technically called "fore milk," are, practically speaking, destitute of cream, and to sell this milk as new milk is evidently fraudulent, and has justly been held so by more than one magistrate. As an example, I will cite the Dublin case, reported in *The Analyst*, August, 1877, p. 82, where one Michael Hayden, a dairy proprietor, was charged before Mr. Woodlock, the divisional police magistrate, for selling milk deprived of its cream; the defendant stated that it was "fore milk," and that he had sold the "strippings" as cream, believing that he was allowed by law to do so. The magistrate expressed his opinion that milk should be sold whole, *i e.*, with both fore milk and strippings, and fined the defendant £10.

The difference in the amount of cream in the first and last portions of milk is thus evidently known to the trade; and the uncharitable may suppose that the object of the Plymouth milkmen in undertaking an experiment costing them two guineas, the value of over thirty gallons of milk, was to enable fraudulent and lucrative practises to be carried out with impunity by casting discredit upon analysts in general and me in particular; the charitable, that the dairymen were animated with a sudden thirst for knowledge, and disired to place the composition of their milk beyond a doubt. I of course adopt the latter hypothesis, and remain,

Yours, &c.,

A. WYNTER BLYTH.

Barnstaple, *September 3rd*, 1877.

SYNCHRONIZED CLOCKS.

Messrs. Barraud & Lund, the chronometer makers, have long been known in the City for the accuracy with which their own regulators were adjusted, but it is an entirely new feature in timekeeping that they have now attempted to regulate, or, as they, perhaps, more correctly term it, synchronize, any or all of the clocks in the City of London. We have recently had an opportunity of inspecting the electrical arrangement by which they are doing this, and we must say that, not only as electrical mechanism, but as a perfect piece of apparatus, it is unique and simple. The arrangement which is supplied to the clock is of the simplest kind, and does not interfere in any way whatever with the works of the time-piece itself, and it can be applied to any clock, no matter what its size may be. The arrangement virtually consists in two small pins, which project through a narrow slit in the dial of the clock, and at regular intervals of one hour *adjust* the clock. An electric current is automatically sent from the regulator in Messrs.

Barraud & Lund's establishment, which passes through an electric magnet, and causes these two pins to approach each other, and for a second nip the minute hand of the clock between them, so that, whether the clock has gained or lost time during the hour, it is certain at the hour to be set right. The mechanism can, if necessary, be removed at any time, without interfering with the clock itself. At present there are some five or six different circuits at work in the City, each one taking from eight to fifteen clocks. Nearly all the banks in Lombard Street and the neighbourhood have adopted it, and many firms at a greater distance. Perhaps among the greatest advantages of this system is its purely automatic character.

CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

To the Editor of "The Analyst."

Sir,—A friend of mine has just handed to me a copy of the *Bath Argus*, September 8th, 1877, containing a report of certain proceedings, which were taken with regard to the adulteration of beer and milk; the cases had been referred to Somerset House, and in their certificate Messrs. Bell, Bannister and Helm state that they found the beer to contain 66·5 grains common salt per gallon. (Mr. Gatehouse for the prosecution found 68 grains.) At the same time they added "The strong Burton beers contain about 60 grains of common salt per gallon, solely derived from the water, malt and hops used."

In a book now before me "Burton-on-Trent, its History, its Waters, and its Breweries," by William Molyneaux, F.G.S., 1870, page 207, there are three analyses of Burton water, in which the amount of chloride of sodium is given as 9·17, 10 01, and 6·636 grains respectively.

The total chlorides of sodium, potassium, and magnesium are—

No. 1.	10·136 grains per Gallon.
No. 2.	12·285 " "
No. 3.	27·433 " "

Further, in June, 1875, I went to the stores in this place, and obtained samples from the respective agents of the under-mentioned Breweries; against them I place the amount of salt per gallon which I found:—

Ind, Coope & Co.	8½ Grains.
Allsopp & Sons	16½ "
Bass & Co.	20 "
Burton Brewery Co.	16 "

The above does not support the Somerset House Chemists in their statement. I can vouch for the samples I worked upon, as I took them direct from the stores of each of the above Firms.

It would be interesting to know what is the experience of other public analysts in this matter.

Yours respectfully,

WM. MORGAN, Ph.D.

Swansea, *Sept. 21st*, 1877.

OBITUARY.

We regret to have to announce the death of Mr. Richard Apjohn, M.A., of Cambridge, Lecturer on Chemistry at Gonville and Caius Colleges, Public Analyst for the County and Borough of Cambridge and for the County of Huntingdon, and Member of the Society of Public Analysts. He died in London on the 13th instant from injuries caused by a fall from a bicycle—one more unfortunate victim to the fancy for athletic exercises which occasionally seizes on the public mind.

ANALYSTS' REPORTS.

Mr. C. H. Piesse, Public Analyst for the Strand District, reports that during 1875-6 he examined 525 samples, of which 33 or 6·3 per cent. were adulterated. Summonses were issued and convictions obtained in 17 of these cases of adulteration, and in the remaining 16 no proceedings were taken.

The two reports of Mr. Edward Sergeant, Public Analyst for Bolton, for the quarters ending March and July, 1877, have been submitted to the Town Council, and we find that in this town, which has a population of about 83,000, only 25 samples have been analysed during the half-year, which is scarcely in our opinion, sufficient to ensure that the character of the articles sold is well looked after. The results of the analyses quite confirm this opinion. Thus, taking them in order, we find—No. 1, milk, 25 per cent. of water; No. 2, milk, 20 per cent. of water; No. 3, milk, 30 per cent. of water; No. 4, milk, 26 per cent. of water; No. 5, milk, skimmed; No. 6, milk, genuine; No. 7, butter, foreign fats; No. 8, butter, 60 per cent. foreign fats; the other samples following in a somewhat similar style. We thus find that 58 per cent. of the samples purchased were, according to Mr. Sergeant's certificate, found to be adulterated. In one case he found a considerable proportion of lead in soda water.

LAW REPORTS.

Collapse of Another Case. — John Sargent, dairyman, of Millbrook Place, Swainswick, appeared in answer to an adjourned summons, charging him with selling adulterated milk on the 31st July. A sample of the fluid in this case had been forwarded to Somerset House, and subjoined is a copy of the certificate thence received:—" The sample of milk referred to in the annexed letter was received here on the 20th August, and the milk was then found to be in a very advanced stage of decomposition. The bottle when received was securely sealed. We hereby certify that we have analysed the milk, and declare the actual results of our analysis to be as follows: Solids not fat, 7·83 per cent.; fat, 2·18; water 89·99; ash, ·70. To these results an addition has to be made for natural loss, arising from decomposition through keeping, but after making such addition both 'solids not fat,' and fat, indicate a milk of low quality. The proportion of ash however is fully equal to the average found in genuine milk. We note that in your letter of the 21st August, you observe that "the cows which had produced it had been kept under cover, and fed upon grains, chaff and gurgeons,' and from experience we are aware that feeding has a considerable influence on both the yield and quality of milk. From a consideration of the character of the feeding and its probable influence on the quality of the milk, together with the results of the analysis, we do not feel justified in pronouncing the sample adulterated with water. J. Bell, R. Bannister and C. H. Burge." Mr. Moger intimated that he should not ask for a conviction in this case, adding that the analysis of the London gentlemen *was identical with the results obtained by Mr. Gatehouse.* There was however a quantity of milk sold in Bath that *would require sophistication with 25 per cent. of water to bring it down to the level of this genuine milk.* The chairman remarked that as there was so much difficulty in detecting the adulteration of milk the public must take care of themselves. At the same time the bringing of the cases before the Bench was a very proper course to pursue.—*Bath Herald.*

At Worship-Street, Edward Butler, baker, of 30, Pitfield Street, Hoxton, appeared before Mr. Bushby in answer to a summons charging him with having sold bread adulterated with alum. Mr. Enoch Walker appeared to prosecute on behalf of the Vestry of the parish of St. Leonard, Shoreditch. He produced the certificate of the public analyst of the parish, showing that the bread submitted to him and stated to have been purchased at the defendant's shop contained 15 grains of alum per 2lb. loaf. The solicitor for the defendant said that his client had trusted the bread-making to his foreman, and from what he had since learnt he would submit to the judgment of the court. Mr. Walker said the certificate stated that the proportion of alum found made the bread injurious to health. The solicitor for the defence said that there was a disagreement on that point between professional gentlemen, and Professor Wanklyn, who was in court, would state the contrary. Mr. Bushby said he should like to ask Mr. Wanklyn a question on that matter. Mr. Wanklyn, having been sworn, said that he was professor of chymistry at St. George's Hospital, and public analyst for Buckignhamshire. He had made analysis his particular study. There was no evidence to show that the quantity of alum in this case would be injurious to health. The danger of alum was in producing constipation. Here it was not in sufficient quantity. Before the bad effect was produced alum had to enter the system. Mr. Bushby asked the object with which alum was used in bread. The witness replied that it enabled sound bread to be made from unsound flour. Flour that *had begun to "go"* would not make good bread. Mr. Bushby supposed that "go" meant "ferment,"

and asked if the flour had begun to ferment what would be the effect of alum upon it. The witness replied that it would arrest the change. Mr. Bushby asked if when flour was "going" it was made into bread, whether, as bread, it would continue to ferment. The witness said it would not be good bread; it would be sour, and not white. Mr. Bushby repeated his question. The witness said that a little fermentation was required in bread to make it rise. Mr. Bushby understood that was obtained by the use of yeast, and asked whether fermentation of the flour did not destroy the quality of the bread. The witness said that alum was then used to arrest the nitrogenous substance, which the incipient fermentation going on would destroy. Mr. Bushby then understood that the use of alum would arrest the fermentation and preserve the nitrogenous substance. Mr. Wanklyn said that was so, adding that directly the fermentation was set up some of the nitrogenous substance would be destroyed. Mr. Bushby was obliged to witness for the light he had thrown upon the matter. This case was not particularly affected by the question whether 15 grains of alum per 2lb. of bread was injurious to health or not. It was clear that the bread was of inferior quality from the fact of alum being in it, and inferior from the loss of nitrogenous substance. He would deal with the case on that point, and as the defendant had pleaded guilty he would not impose upon him a heavy penalty, the *maximum* being £20, but fine him only 20s. and costs. Mr. Walker intimated that on a future occasion he would be prepared with scientific evidence to support he statement as to the injurious effect of alum.—*Times.*

POISONED SALT.—In the United States District Court of Admiralty an action has been tried, arising out of the mixture of arsenic with a large quantity of salt, *en route* from Liverpool by the ship *Niagara*, which arrived at New York in March, 1874. The cargo consisted in part of 4800 sacks of salt, and the ship also brought over ninety-nine kegs of powder arsenic. The salt and arsenic were stowed in close proximity, and several kegs of the arsenic were broken open and their contents became mixed with the salt. The consignee said that the salt was poisoned and entirely worthless, and sued the owners of the vessel for damages. The defenders set up that the kegs of arsenic were broken open by stress of weather, and that only a very small portion of the salt was impregnated by the poison. Careful analyses of the salt were made, and experts were called upon to testify. The salt and arsenic were alike white and undistinguishable by the eye. Two bags of the salt were tested. In one three grains and a half of arsenic was the average to a pound of salt. In the other bag arsenic was found in salt taken from the centre of the bag. Professor Doremus said that the salt ought to be used solely for purposes in which human life would not be endangered. Professor Chandler, on the other hand, expressed the opinion that no harm could come from the use of portions of the salt examined by him, because no person would consume enough of it to affect him. Judge Blatchford holds that the salt was so impregnated with the arsenic, as to be dangerous, and says:—"The neglect of the master was a gross wrong to the owners of the vessel, the owners of the salt, and the entire community, who might very well, some of them, have actually consumed some of the salt and some of the arsenic with it, but for the prompt action of those receiving the salt from the vessel." A decree is ordered in favour of the libellants with costs, and a reference to ascertain the amount of damages. —*Grocer.*

NOTES OF THE MONTH.

ON another page we reprint a letter from Mr. Wynter Blyth in reference to the milk case which we referred to in our last. It is very much to be regretted that the *Medical Examiner* should have inserted a paragraph in reference to this case, which was based upon evidence quite as insufficient as that which first led to the cowkeeper's letter in the *Western Morning News.* Mr. Blyth's letter must be held to finally settle the question that the milk referred to was abnormal milk—whether it had been rendered abnormal by skimming or some peculiar mode of milking with which dairymen are specially familiar.

The publicans appear determined not to let the disputed question of Gin *versus* Gin-and-water rest yet. A lengthened correspondence has been going on in the columns of a variety of papers, and many persons, amongst them lawyers, have been called in to express their opinion that gin-and-water is still gin. No doubt, in a teetotal sense, the Good Templars would be glad to find it so. But there is another aspect to the case.

Mr. Poland's opinion is decidedly that the gin as sent from the distillery may not be reduced by dilution with water and sold as gin, unless the publican affix to it the proper label specifying that it is gin-and-water. This quite accords with the decisions which Justice Mellor and Justice Lush gave in the appeal case of Webb *versus* Knight, but is if anything a little more stringent. Lord Truro seems to have been greatly exercised lately in reference to the adulteration of beer and spirits. In writing to the *Times*, his lordship is so philanthropic as to think that it is the drugs introduced into the manufacture of these beverages which produce intoxication. The only unfortunate circumstance in connection with Lord Truro's statement is that the public analysts of the kingdom, whom we must consider to be on the whole the best judges, have not yet succeeded in finding any sensible quantity of drugs introduced into either beer or spirits; but, on the contrary, the complaints which they have had to make, and on which publicans have continually been summoned, have been that the latter had added water—not drugs; and water surely cannot conduce to intoxication any more when it is added to gin than when it is put in the form of Simpson to milk. The facts which we published in THE ANALYST in April of this year are very significant on this point. During the years 1875-1876 the returns show only 175 samples of adulterated beer and spirits; and they show 833 samples of adulterated groceries and 1,483 samples of adulterated milk.

We publish a letter from Dr. Morgan, of Swansea, which is worth the consideration of analysts generally, and we invite our *confreres* to give us a record of their actual experience in the matter. We have ourselves analysed the Burton waters repeatedly, and our results are accordant with those of Dr. Morgan on the ales.

"The public analyst for——————presents his compliments to Mr. Simpson and requests to know with what he fed the cows which yielded the sample of milk obtained from him by the inspector on the———day of————187—." This is a new form of enquiry which all analysts had better have printed at once, if they desire to keep in the paths of rectitude as laid down at Somerset House, and then they may possibly escape the fate of Mr. Gatehouse, as detailed in the paragraph which we reprint on another page from the *Bath Herald* of the 8th September.

The remarks of the prosecuting solicitor are very much to the point and more severe than any we could add, but we question whether, before assuming a particular amount of *natural* loss, it would not be quite as fair to ask for a copy of the results obtained on the fresh milk, and see really what loss had taken place, instead of taking an indefinite and as yet undetermined quantity as *natural loss*, and on that, aided by some peculiar and *unpublished* views on the effect of feeding on milk, condemn the analysis of a fellow chemist. If the ash obtained by the Somerset House chemists be the same as that obtained from the fresh milk, then the samples are clearly identical, and if the solids not fat agree with those previously found, it is unjust to assume a *necessary natural loss* in a sample when, as is sometimes the case, little or none takes place. It is this sort of systematic straining of opinions to give the benefit of an imaginary doubt, which goes far to encourage the traders to continue the addition of water. The sooner Mr. Bell publishes his table showing the relative effects of "grains," "chaff," "gurgeons," and "keeping under cover," on the *solids not fat* of milk, the better for both public analysts

and the public. Hitherto we have found feeding to affect the *fat*, but we have found nothing but *partial milking* or *positive disease* which lowers the solids not fat to 7·83 and until we do so we must decline to be "gurgeons" caught by "chaff." We shall, however, be pleased to give publicity to Mr. Bell's figures if he will send them.

We reprint a note on oxide of zinc contaminated with sulphite of zinc. We draw special attention to this because we have ourselves found practical difficulty to arise in commercial work from the presence of this form of adulteration; as far as we know, the details of the analyses of samples so adulterated have never before been published.

Castor Oil Pills are still to the fore. It seems a strange thing that there should have been such a discussion over a trivial thing like this. Druggists—of all men—ought to be most careful to sell exactly what they are asked for, and to sell it under its proper name, and certainly no one knows better than druggists do that castor oil pills, properly so called, do not exist. Why, then, is not the name at once given up?

One of our contemporaries, speaking of the water supply of one of the largest of the midland towns, says:—"The supply does not appear to have been so good as usual, an increase in organic matter being noted, and also the presence of infusoria, both no doubt due to inefficient filtration. *No harm, however, will be done by either.*"

Such a statement as the latter appears to us to fully justify another statement which the same journal made not long since, that the amount of sulphur present in gas as an impurity was not injurious, but it was only the carbon which did the harm. It really seems time that our engineers and sanitary officers had better information on scientific points than this.

There have been a large number of paragraphs lately in the London press, and some in the provincial press, in reference to the adulteration of treacle with arsenic. We have taken some pains to investigate the matter thoroughly, and are in a position to say that there is no foundation for the fright which has been caused by these rumours. The matter did not originate, as is stated, in the fact of a large quantity of treacle becoming accidentally mixed with arsenic in Lewisham, but simply from the fact of a small quantity of treacle with which some children were being fed having a small portion of arsenic accidentally mixed with it. The result of the examination which we have made of some dozens of samples from the same neighbourhood shows that they are all pure.

We should have thought the time had gone by for such statements as these in reference to the analysis of butter. It is extracted from the *Chemist and Druggist* and quoted by them from the *Pharm. Centralhalle.*

DETECTION OF LARD AND SUET IN BUTTER.

The butter, to which water has been added, having been first heated for two hours over the water bath, to remove saline and some other constituents, is thus treated:—five parts of concentrated sulphuric acid are agitated with three of the butter, and a nearly transparent yellow fluid is produced, soon becoming a clear yellowish red; if suet or tallow be present (but not otherwise) this will, in the course of half an hour acquire a dark reddish-brown tint.

An enquiry has taken place at Bath as to the death of a woman who is alleged to have been poisoned by her husband. The stomach and other viscera of the deceased were submitted to Mr. Gatehouse, the Public Analyst for Bath, who found copper present. Thus the liver contained 1·16 grains of copper, and the other viscera about 2½ grains. No other poison was detected, except a minute trace of antimony, which Mr. Gatehouse considers was present as an accidental impurity in the copper salts. This case appears to us to form a very practical commentary on the paper on copper in peas, by Dr. Paul and Mr. Kingzett, abstracted in our last number. As far as we remember there are only one or two previous cases on record of poisoning by copper salts. It certainly appears that this one case is worth far more than all the experiments made by the authors of the paper in question. It does not follow that because two men in good health can partake, without actual injury, of a daily dose of poison, a feeble woman can do the same. The public are, at any rate, entitled to the protection of the law against such practices. The makers of the so called preserved peas can have no ground of complaint, for if they simply label their canisters—"This is a mixture of preserved peas and sulphate of copper," the public can buy them if they please. Till they do so we hope every brand in the market will be carefully examined, until the sale of such an abominable mixture is entirely stopped.

RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Southampton Row, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
4826	F. Maxwell Lyte	Production of Ammonia Anhydride	6d.
4847	A. M. Clark	Crucibles, &c.	8d.
1877.			
92	P. Piccard	Evaporating Saline Solutions	6d.
135	J. Hooper	Lamps for Burning Hydrocarbon Oils...	6d.
351	C. W. Harrison	Impregnating Atmospheric Air, with inflammable vapours	2d.
357	D. McFarlane	Purifying or Treating Alcoholic Liquids	6d.
407	C. C. Creeke and H. Sharp ...	Sewer Ventilator	6d.
426	W. Cormack	Utilizing Refuse Acid Liquors...	2d.
488	J. H. Johnson	Treating Sewage, &c....	4d.
492	P. Jablohkoff	Apparatus for Generating Electricity	6d.
494	Ditto	Electric Lamps	6d.
493	J. E. Sears	Ventilating Rooms, &c....	2d.
609	W. Martindale	Apparatus for Inhaling Medicated Vapour	2d.
612	A. M. Clark	Obtaining and Fixing Nitrogen in Inert Substances for Fertilizing Purposes...	4d.
697	D. B. Hewitt	Utilizing the Sulphur contained in Vat or Soda Waste	2d.
683	J. Stuart	Manufacture of Sugar	4d.
684	J. Toussaint	Crucibles...	4d.
820	E. A. Parnell	Manufacture of Metallic Zinc and Sulphuric Acid ...	2d.
1814	T. N. Kirkham, D. Hulett, and S. and J. Chandler ...	Purifying Gas	4d.
2261	S. Pitt	Utilizing the Bisulphide of Carbon and Glycerine for the Production of Motive Power, &c.	4d.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Medical Record; The Miller; The Anti-Adulteration Review; Report on Various Methods of Dealing with Meat Seized as Unfit for Human Food, by Dr. Sedgwick Saunders; Journal of Applied *Science*; The Country Brewers' Gazette.

THE ANALYST.

THE SOMERSET HOUSE COURT OF APPEAL?

It will be in the recollection of nearly all our readers, that when the Sale of Food and Drugs Act, 1874, was before the House of Commons, the Public Analysts of this country and many independent members of the House of Commons acting on behalf of their constituents, opposed very strongly the appointment of the Inland Revenue Chemists as referees in disputed cases under the Sale of Food and Drugs Act. This opposition was not made from personal grounds, but simply because the members and the analysts doubted the sufficiency of the experience which the Inland Revenue Chemists had had in such cases. From time to time since a few incidental matters have cropped up which have been sufficient to show that the doubt was not without foundation; but the mode of procedure which the chemists at Somerset House have adopted, has been so extremely cautious and tentative that it is only occasionally that a case has come to light to which it has been necessary to draw public attention through the failure of justice which has been occasioned by their conduct.

At the time when the question was before the House of Commons, the arguments on the point were very strong, and it was contended that tradesmen were suffering severely by the want of a competent! Court of Appeal; but the fact that the Inland Revenue Chemists only had to analyse five or six samples during the first year in which this duty was imposed upon them—and if our memory be right, they confirmed the analyses of the analysts in three cases of these five, and in one other case had opposed to them five chemists of wide reputation, and who all disagreed with their deductions—is sufficient, we think, to show that there was not much need for *such* a Court.

The letters which are published in our correspondence column this month, throw some further light on the matter. Our readers will also remember the letter from Dr. Morgan, of Swansea, which we published in our last number, wherein he stated that these Somerset House Chemists having found a certain sample of beer to contain 66·5 grains of common salt per gallon, added "Strong Burton Beers contain about 60 grains of common salt per gallon, solely derived from the water, malt, and hops used." This statement, however, although made above the three signatures of Messrs. Bell, Bannister, and Helm, is not only different from the results which the Chemists of the Inland Revenue Department at Somerset House themselves found only a few years since, but is, in fact, inaccurate.

The circumstances under which the previous investigation took place were, that salt having been inserted in the schedule of the Licensing Act as one of the prohibited ingredients, and complaints having been made by some of the brewers in reference to this, the Somerset House Chemists were directed to make an investigation into the amount of salt contained in ordinary ales, and the result of the investigation which they then made was that the rule was relaxed so far as to allow of the excessive amount of 50 grains of salt per gallon; and if our memory be right—we have not the figures before us now—the *maximum* amount in all the samples (several hundred in number), which were examined for the purposes of this enquiry was not more than about 55 grains per gallon, and we believe that this occurred in one case only.

It is hardly to be wondered at that the Burton brewers, resent such an outrageous statement. The Burton water certainly does not derive its excellence for brewing purposes from the amount of salt it contains, or it would be easy to imitate it; and it is scarcely possible for the Inland Revenue Chemists to make a more unjust or unfounded statement than to say that the strong Burton ales contain about 60 grains of common salt per gallon.

The paper which we publish from Mr. Gatehouse, shews pretty conclusively what is the maximum amount which can be derived from the malt and hops used. The amount present in the waters is capable of the most ready determination, and there can be no possible difficulty in allowing for the amount of concentration which takes place during the brewing process, and we affirm, unhesitatingly, that it is extremely rare to find a sample of genuine ale from any of the leading Burton breweries containing so much as 60 grains of salt per gallon. In this case, therefore, the want of knowledge on the part of the Inland Revenue Chemists has led to a failure of justice.

We must go further. Not content with failing to make themselves acquainted not only with what had been done by other analysts, but also with the reports which had been issued from their own laboratory, the Inland Revenue Chemists, who were, up to 1873 or 1874 unfamiliar with the subject of milk analysis—while other chemists had worked on the matter for many years previously—have since then examined samples of milk, many of which have, apparently, been taken from under-fed or imperfectly-milked cows, and a large proportion of which have, in all probability, been some days in the course of transmission to Somerset House, and on the basis of these experiments they have evidently come to the absurd conclusion that milk always decomposes at a certain definite rate, and that if they analyse a sample a certain time after it has been examined by the original analyst, they must make allowances on the results which they obtain before they form their conclusions as to its purity or otherwise. More than this, instead of taking the milk of average cows or an average dairy as a standard, or instead of taking the milk even from the poorest healthy cow which they could meet with, and which was not half-milked—they actually go out of their way, not only to take as a standard the milk of under-fed cows, but also to do, what the Sale of Food and Drugs Act certainly does not in any way authorise them to do, viz., receive and act upon *ex parte* statements of the "*poor prosecuted milkman*," as to the character of the food upon which the cows have been kept. It is incredible that any Court of Justice could, for one moment, admit evidence founded upon irregular statements of this kind.

Still one more point we must raise. By whom are the analyses at Somerset House executed? We cannot forget the fact that before a Committee of the House of Commons, not many years since, the heads of this very laboratory gave evidence "that neither by chemistry nor by any other means was the admixture of chicory with coffee to be detected." Even supposing that we admit that these men themselves do the work, are they honestly qualified to successfully contradict, by the examination of stale samples, the evidence of men who have been selected, by open competition, for the posts which they hold, and whose appointment has been in every case confirmed by the Local Government Board, and who have worked upon the fresh sample, while it was still in a state fit for analysis? Still more: is it just that a certificate from Somerset House, should be taken as a certificate representing the actual work of three men who in most cases are not *cross-examined, in contradiction* to the evidence of Public Analysts who are cross-examined,

when the fact is notorious that only one, if any, of the three signatories to the Somerset House certificate has been actually concerned in the analysis? Let the certificate of each man's work bear its own proper signature only, and then there will be a fair basis on which to act, as his position and salary will be then known, and the magistrates will be better able to judge into whose hands the reputation of the original analyst has been placed.

We do not say more now, because we know that as soon as Parliament meets, the matter is to be brought before the House of Commons, and we think this will be the most satisfactory mode of ventilating the whole subject; and, as amendments are certain to be made in the Act next session, it will probably be a convenient time for amending this point also, and relieving the Inland Revenue authorities from this source of anxiety. If prosecuting solicitors would only insist on the personal attendance of these gentlemen in the witness box, and give them full scope to air their little wisdom, the world would be the wiser, and the Somerset House Chemists more laughed at.

THE CHEMICAL SOCIETY'S JOURNAL.

SOME months ago a general meeting of the Fellows of the Chemical Society was held at Burlington House. At this meeting, among other things, the condition of the Society's Journal was discussed, and various improvements were suggested and promised. So far, however, we are sorry to say, no beneficial results seem to have been produced. The Journal appears as late as ever, and the character of the abstracts becomes less and less satisfactory. Take the September number, for example. In this (page 271) we have an abstract of rather more than half a page, in which we are informed that, as it was difficult to form an abstract we had better consult the original. Why then attempt abstraction at all? On the same page an abstract of rather more than a page in length begins, written by some one, (whose initials, by-the-bye, we do not find among the recognised abstractors given on the cover,) which few, we believe, will understand fully unless they have read the original; the attempted explanation of the fact that bubbles are sometimes attracted, sometimes repelled by heat being particularly unsatisfactory. On page 275 space is wasted on a perfectly childish experiment, called "Abortive experiment on Torpedoes," and the three abstracts, "Apparatus for Oxidation," "Laboratory Gasometer," and "A cheap Gas Blow-pipe," would have been more advantageously placed in the waste paper basket of the editor. The next sixty pages are chiefly devoted to abstracts on organic chemistry, which we pass over with the remark that a very undue proportion of space is devoted to abstracts of papers, the authors of which claim an intimate acquaintance with the exact position of every atom in even the most complicated compound. This may be very interesting to chemists who, like the authors of these papers, fancy themselves hail-fellows-well-met with every atom under the sun, but it is somewhat tedious to ordinary chemists not on the visiting list of either atoms or molecules. Passing on to other portions we come, on page 373, to what is probably the gem of the collection, entitled "Differences observed in unadulterated milk (we suppose unadulterated milk from healthy cows is meant) in which the specific gravity of cows' milk is said to vary between 1018 and 1045!!! This is really too much for our feelings, we must stop, and can only exclaim, whisper it not at Somerset House, or the increase in our dairies of the

well-known breed of cows favoured with iron tails, will be something truly alarming. In order to improve this lamentable condition of things, and to render the journal worthy of the Chemical Society of London, and an expenditure on it of over £1,500 a year, we venture to offer the following suggestions. Instead of hampering our able Editor with two dozen abstractors, occasioning the loss of much time and the frittering away of money, let there be but two, or at most three. These should be required to devote the greater part, if not the whole, of their time to the work of abstraction. A room in Burlington House should be set apart for their labour, and as an additional inducement to young but able chemists, the laboratory of the Society should be fitted up and placed at their disposal for certain kinds of work to be determined, or approved, by the Council. Under such an arrangement the Editor, and the Council of Publication, would have the whole work much better under control, which in consequence would be done with much greater regularity, and on the whole, much better than at present.

ON THE AMOUNT OF SALT IN BEER.

By J. W. Gatehouse.

On July 30th, a sample of beer, brought me for analysis by our Local Inspector, was found to contain 68·5 grains of common salt per gallon.

The case on being taken before the Bath Magistrate, was by them, at the request of the defendant, referred to the analysts at Somerset House. On September 7th, at the adjourned inquiry, a report was read, signed by Messrs. Bell, Bannister & Helm, which, whilst giving the amount of salt present as 66·5 grains per gallon, and thus substantially corroborating my own analysis, yet appended as a rider, that they considered the beer might not be adulterated as they had found certain samples of strong Burton beer to contain about 60 grains of salt per gallon, derived solely from the water, malt, and hops used in brewing. On the strength of this statement the magistrates dismissed the case.

Feeling assured that the Somerset House Chemists had made some mistake in the latter part of their statement, I have investigated the possibility of discovering from the composition of the beer itself, the maximum amount of salt that could be derived from the malt and hops, so that supposing the amount of chlorine in the water used to be known, the maximum amount which could naturally exist in the beer might be calculated.

In order to arrive at this conclusion, we must, in the first place, know the percentage of chlorine calculated as salt present in malt and hops; and secondly, be able to calculate from the analysis of the beer, the amount of each used in brewing a given quantity of the beverage.

Oudeman's gives the amount of ash in barley at 3·1 per cent., and that of malt as 2·7 per cent. Fehling and Faist find the ash of barley to vary between 3·04 and 2·1. Polson gives it as 2·8, and Way and Ogston from 1·79 to 2·3 per cent., the mean of nine analyses being 2.09. Muspratt found for barley 3 per cent., and malt 2·52.

In experiments made by myself, a sample of barley gave 2.44 per cent. of ash, of which 2·04 was soluble in acid and ·4 insoluble.

Malt from the same barley gave 2·47 per cent. of ash, of which 1·91 was soluble, and ·56 insoluble in acid. The malt dust from the same sample yielded 8·4 per cent. of ash, of which 5·43 was soluble and 2·57 insoluble in acid. Another analysis of a

different sort of malt, and malt dust from the same sample gave respectively 2·44 and 5·69 per cent. of ash, so that it is plain that in the act of germination barley loses not only organic, but also a considerable amount of its inorganic constituents, and it will be seen that a goodly percentage of this inorganic matter is derived from the soluble chlorides contained originally in the seed. Way and Ogston state that the *ash* of barley contains from a trace of salt only an amount varying up to 2·47 per cent., their analyses of nine samples being respectively: a trace, 0·41, 0·56, 0·61, 0·725, 1·44, 1·59, 2·01 and 2·47 per cent., giving a mean of 1·09 per cent., and as malt certainly contains a less percentage than this, the amount of salt possible in a beer derived from the malt alone could not be greater than the highest of these percentages, and would with great probability, be lower than the mean. An analysis made by myself of the malt and malt dust mentioned above, gave for the malt only an unweighable trace of chlorine, but for the malt dust 0·04 per cent. of argentic chloride, which equals 0·0164 per cent. of salt. The barley, malt, and malt dust also mentioned before, gave respectively ·00815, ·0053, and ·0256 per cent. of salt. In each case 1,000 grains were burnt, and the chlorine calculated in the whole amount.

We are therefore warranted in coming to the conclusion that the ash of malt is not higher than 2·5 per cent., and also that the percentage of salt this ash contains theoretically, as calculated from the total amount of chlorine present, is certainly less than 1 per cent., giving a percentage of ·025 of salt in malt, as a possible maximum, this being probably many times higher than the average amount.

From the analysis of Way and Ogston, hops appear to contain from 5·95 to 8·07 per cent. of ash, and of this from 3·72 to 4·28 per cent. consists of salt. Taking the highest of these numbers, this would give us 0·345 per cent. of salt in hops. My own analysis of a sample gave an amount of chlorine corresponding to 0·062 per cent. of salt.

As the amount of hops used in brewing is seldom, if ever, more than 20-lbs. per quarter of malt for bitter beer, and generally less than half this in strong beer, and as this weight of malt would brew at least two barrels of beer or 72 gallons, the salt derived from the hops, could not in bitter beer exceed 6·7 grains, and in strong beer 3·35 grains per gallon.

In order to find the original amount of malt used in brewing any sample of beer, we require to know two things: first, the amount of alcohol; and secondly the amount of solid extract the beer contains, or the specific gravity of the boiled beer made up to its original bulk; from which, neglecting the small quantity of acid, we can find the original gravity of the wort, and the total amount of malt extract before fermentation. From these data the weight of malt used in the brewing, is easily deduced, as by Ure's experiments, a quarter of malt weighing on the average 320-lbs., will yield about 210-lbs. of extract, or in brewer's language, a barrel of 84-lbs. gravity.

That the calculations based on these facts may be more clear, we will now take an actual example of beer analysis, in order to compare the amount of salt it could contain, with that actually present. The beer was a sample of the strongest Burton I could procure, made by a well-known firm.

Specific gravity	1025·8 per cent.	
Amount of alcohol	8·65 ,,	
Specific gravity of boiled beer		1,039·6
Specific gravity of the alcohol 985·5, giving a "spirit indication" of 14·5, which by the tables, gives an additional gravity of		67·6
Original gravity of wort		1107·2

From this "original gravity," we next proceed to find the quantity of malt extract it contained, which may be done either from Ure's tables or by the following calculation.

Subtract 1,000 from the original gravity, divide by 100, and multiply by 2·5, will give the total amount of malt extract per gallon in pounds weight.

To show that the above rule agrees with the tables, a wort of specific gravity 1032 would, by the tables, contain 7·95 per cent. of extract, or ·795 pounds per gallon, whereas by calculation 1032—1000=32, and $0·32 \times 2·5 = ·8$.

Proceeding with our calculation above, an original gravity of $1107·2 = 1·072 \times 2·5 = 2·68$ pounds of malt extract per gallon, and as 320 of malt = 210 of extract, the amount of malt used $= \frac{2·68 \times 320}{210}$

But as the percentage of salt in malt is not greater than ·025 per cent. the amount of salt in this $= \frac{2·68 \times 320 \times ·025}{210 \times 100}$ or expressed in grains $\frac{2·68 \times 320 \times ·025 \times 7000}{210 \times 100} = 7·15$.

In this calculation we have taken no note of the amount of salt derived from the hop, but as it was not a bitter beer, if we add 3·35 grains, as before calculated, we shall obtain a total of 10·5 grains due to malt and hops alone.

The published analyses of the water used in the brewery where this beer was made, gives about 14 grains of salt per gallon, so that from malt, hops, and water, we get a possible amount of 24·5 grains of salt per gallon. The amount actually obtained by an analysis of the same beer was 18·24 grains, or about $\frac{3}{4}$ of the possible amount.

As the whole of the numbers above used are constants, except the 2·68 obtained from the beer under examination, we may materially shorten the process by the annexed rule.

To find the possible amount of salt in a beer due to malt alone,—Deduct 1,000 from the original gravity of the wort, divide the result by 100, and multiply by 6·6, which gives the salt in grains per gallon.

To take a case:—

A Beer just analysed by me was found to contain Alcohol 5·2 per cent.	
Malt Extract 7·38 "	
The specific gravity of the Alcohol being ·9911 the spirit indication was 8·9 which by the tables gives an original gravity of ...	38·6
Gravity of Boiled Beer	1030·6
Original gravity of Wort	1069·2
Salt due to Malt alone	$= ·692 \times 6·6 = 4·567$
Salt due to Hops	3·35
Salt due to Water unknown	
Possible total due to Malt and Hops ...	7·917

Amount of salt actually found by analysis 8·55. This process will thus, if the amount of salt in the water be known, always give a theoretical amount largely in excess of any that will actually be found, and yet sufficiently near to enable one to judge of the actual amount of adulteration, as the general character of the water in his district will always be known to the analyst.

A very slight consideration of the statement made by the Somerset House Chemists, that a certain Burton beer contained 60 grains of salt per gallon, due to the water, malt, and hops alone, will thus be seen to be based on some mistake, except the beer were purposely brewed from a water largely charged with salt, and much more so than is usually the case, even with Burton waters.

Even if a beer were brewed, so strong as to contain the extract from a quarter of malt in a barrel, the amount of salt per gallon could not possibly exceed—

From Malt $\frac{310 \times 7{,}000 \times \cdot 025}{100 \times 36} =$	15·5 grains.
Maximum due to hops ...	6·7
Maximum due to malt and hops	22·2

leaving nearly 40 grains per gallon for the water alone.

This, however, is in every respect an extreme theoretical case, the amount of 18·24 grains as actually found in the strong Burton, examined by me, being much nearer what I believe will be actually found in practice.

This case shews, at least, how much Public Analysts lie at the mercy of statements made by Somerset House officials, without proof of their accuracy being offered.

ON THE PRODUCTS OF COMBUSTION OF COAL GAS.

By C. Heisch, F.C.S.

Now that the excitement of Parliamentary contest is (at least for the present) over, I think it may be well to lay calmly before your readers some, at least, of the reasons which have led me to the conclusion (shared, I am glad to find, by Silliman and other good authorities,) that the greater part, if not the whole, of the sulphur contained in coal gas, is converted during combustion into sulphuric acid. As there can be no question that sulphurous or sulphuric acid must be the result of the combustion, the investigation is really confined to establishing the presence of one or other, or both, of these compounds in the air of a gas-lighted room.

My experiments were first directed to establishing the presence or absence of sulphurous acid.

In a small room, containing only 292 cubic feet of air, an ordinary batwing burner, consuming 4 cubic feet per hour, was burned continuously for from 24 to 48 hours. The gas contained an average of 22 gr. of sulphur, per 100 C.F. The only ventilation was the want of absolute tightness in the door and window, and one or two chinks in a boarded partition. Pieces of paper moistened with a solution of iodic acid and starch paste were suspended in various parts of the room, but no coloration was to be found, though in this small space from 20 to 40 grs. of sulphur were burned during the different experiments. This was repeated many times, and on one occasion only, two of the slips of paper were discolored: one of these was supended directly over the burner, the other over one of the chinks in the partition, before mentioned, so as to catch any outward draught there might be. An examination of the gas was conducted in the ordinary way, at the same time, and on this particular day the gas contained nearly three times as much ammonja as usual, which led to the belief that the discoloration of the paper was due to some nitrous compound formed by the combustion of the ammonia, and not to Sulphurous acid. This idea was confirmed by the fact that when the gas was passed through acid before being burned no discolouration occurred. This experiment was many times repeated, always with the same negative result. Much stress has been laid by some on the fact that if the gas be burned in a Referees' sulphur apparatus without ammonia, little sulphuric

acid is condensed, and, impressed with the idea of the high boiling point of that acid, the conclusion has been arrived at that if present it must be condensed. By connecting the end of the eduction tube of the Referees' apparatus with a good condenser, I found that much more sulphuric acid could be obtained, showing that it did pass out of the eduction tube, though there is no doubt a large amount of sulphurous acid is formed *in* the apparatus. Does the combustion, then, in this apparatus correspond with the ordinary combustion in a room where the products of combustion are at once mixed with an enormous excess of air? To test this several analyses were made of the air from the eduction tube, and it was found to contain only from 13 to 14 per cent. of oxygen, and 4 per cent. of carbonic acid; indeed it extinguished the flame of a taper when brought in contact with it. Having thus shown the difference between experiments, conducted in this apparatus and the ordinary combustion of gas, I made the following experiment to see how soon the sulphurus acid from the eduction tube would oxidize if brought into the air. A common lamp chimney, 7 inches long and 2 inches wide, was suspended over the end of the eduction tube, so as to receive the ascending current of hot air. Paper moistened with iodic acid and starch was suspended in this, and though such paper was rapidly blued at the mouth of the eduction tube, half way up the chimney it remained uncoloured.

I come now to the more positive proofs of the presence of sulphuric acid in the atmosphere of rooms in which gas is burned. I put on one side for the present all experiments with leather and metal goods, though in an economic point of view they are very important, and confine myself simply to the amount that can be condensed by merely lowering the temperature of the air, and its relation to the quantity of sulphur contained in the gas.

In the small room before mentioned gas was burned at 4 cubic feet per hour in a bat wing burner, after three hours a half-gallon flask full of powdered ice was taken into the room and left till the ice was all melted (about 3 hours). The flask was placed at 4-ft. 6-in. from the ground, or about breathing height. The outside of the flask was then washed with distilled water, and the washings precipitated with Ba Cl. An average of several experiments thus made with gas containing just over 20 grs. of sulphur per 100 cubic feet gave H_2SO_4 ·3 grs. condensed.

A similar set of experiments made with gas containing an average of 10 grs. per 180 cubic feet gave only H_2SO_4 ·056.

Now as there can be no doubt that the mischief done by the acid formed must be, to a great extent, in proportion to the ease with which it is condensed, we have here a proof that the mischief increases much more rapidly than the actual increase of sulphur. These experiments are also interesting as showing that notwithstanding its very high *boiling* point, the *condensing* point of sulphuric acid, when mixed with air, is like all other vapours, altered very rapidly, according to the proportion of air with which it is mixed. This need not surprise us when we remember that water which *boils* at 212° has been found in the state of vapour in the atmosphere at a temperature of—100° F, and there is good reason to believe exists at much lower temperatures. I am now engaged in a series of experiments to test those facts still more strongly and precisely, and these together with the experiments on the effect on metals and other bodies of the air of gas-lit rooms, I hope to lay before your readers on a future occasion.

ON THE PRODUCTS OF COMBUSTION OF COAL GAS.

By W. C. Young, F.C.S.

Does the presence of sulphur in gas produce sulphuric acid in sufficient quantity by its combustion to be injurious to health or property? This is a question which has exercised the minds of many for a long period, and was recently warmly debated before a committee of the House of Commons. Having stated to that committee my firm belief that the greater part, if not the whole, of the sulphur is converted into sulphuric acid, I propose to give in this paper, an account of the experiments upon the results of which I based my conviction.

The surfaces of varnished wood work, and the moisture condensed upon the cold surfaces of windows exposed in a room where nothing but gas had been used for lighting or heating purposes, gave very strong acid reactions to litmus paper, which acid proved to be sulphuric, and although I found considerably more on the upper part of the room, still the evidence was strong from the lowest portions. This led me to suspend various moistened surfaces in the room, so that by measuring the gas consumed during the time they were hanging, I could ascertain the amount of sulphuric acid deposited upon every square foot for each 100 cubic feet of gas burnt.

1st.—Two square feet of linen, moistened with water:

100 cubic feet of Gas burnt, gave ·9 $Ba\,SO_4$ = ·377 $H_2\,SO_4$
100 cubic feet of Gas = ·189 grains $H_2\,SO_4$ on 1 square foot.

2nd—One square foot of bibulous paper, moistened with water:

100 cubic feet of Gas burnt, gave ·45 $Ba\,SO_4$ = ·19 $H_2\,SO_4$
100 cubic feet of Gas = ·19 grains $H_2\,SO_4$ on 1 square foot.

In the foregoing experiments no attempt was made to check the ventilation of the room, which was of the most perfect kind, there being an opening six inches square into the flue close to the ceiling, and another communicating with the outer air, close to the floor. The paper and linen dried in about two hours.

3rd.—Nine inches square of bibulous paper, moistened with weak solution of bicarbonate of soda, suspended a few inches in front of ventilator, in upper part of room:

150 cubic feet of Gas burnt, gave ·70 $Ba\,SO_4$ = ·293 $H_2\,SO_4$
100 cubic feet of Gas = .347 grain $H_2\,SO_4$ on 1 square foot.

4th—Repetition of 3rd, using weak solution of potash instead of bicarbonate of soda, paper being 4½-inches square:

72 cubic feet of Gas burnt, gave 1 $Ba\,SO_4$ = ·42 $H_2\,SO_4$
100 cubic feet of Gas = 4·14 grains $H_2\,SO_4$ per square foot.

The two last experiments show clearly that a great part of the sulphuric acid produced was being removed by the very perfect means of ventilation in use, and the gas did not, at any time during the experiments, contain more than 12 grains of sulphur per 100 cubic feet. These results seem to me to show that whatever the sulphur was resolved into immediately after combustion, it was ultimately converted into sulphuric acid.

Having noticed that dust collected in rooms where gas had been much used was strongly acid, I collected some from the top of a wardrobe cupboard, which had been standing in a bedroom undisturbed for six months. The dust was boiled in water,

filtered, and the acidity of the liquid, ascertained in the usual way, I found to be equal to 1·005 grains, H_2SO_4.

The top of the cupboard was 3-ft. by 1-ft. in surface, so that each square foot would give ·335 grain, H_2SO_4. This calculated for the whole surface of the four walls (the room being 12-ft. by 9-ft., and 9-ft. high), supposing the acid to be evenly distributed over them, the gas having been burnt for twelve hours a day on an average, at the rate of about one cubic feet per hour, making altogether about 2000 cubic feet, would indicate that two grains of sulphur per 100 cubic feet was deposited thereon as sulphuric acid.

As the wood upon which the dust had collected, had no doubt absorbed some of the acid into its pores, I cut three square feet out of the top of the canopy of the bed furniture in the same room, and treated it with boiling water, filtered, and took the acidity of the solution. This amounted to 1·42 grains H_2SO_4, which, calculated as above, would indicate that three grains of the sulphur in each 100 cubic feet of gas consumed was deposited as sulphuric acid. Certainly a very large proportion, considering that the room had been in ordinary use during the whole six months, the window opened for a considerable time daily.

I obtained from a tradesman two glazed show cards, which had been hanging in his shop for six months, in which no coal fire had been used. There had been five burners, burning about three cubic feet per hour each, in use for about three hours per day, so that in round numbers about 6,000 cubic feet feet had been burnt.

The cards were well washed with hot water and the acidity of the solution taken.

1 card, 3-ft. by 1-ft. = 1·78 grains H_2SO_4
2 ditto, 1-ft. by 1-ft. = ·588 " "

Calculated on the amount found upon the first card there would be ·01 grain H_2SO_4 on one square foot from 100 cubic feet of gas.

These cards had been suspended vertically, but the following experiment was made upon the top of a tin box, which had been laid upon a shelf, of course presenting a horizontal surface.

The box had remained undisturbed for fifteen months; during that time four burners had been in use for lengths of time per day varying with the season of the year. I have made an average which indicates that about 16,000 cubic feet of gas had been consumed during the whole period. The acidity found was equal to 1·96 grains of sulphuric acid upon the whole surface, which was one square foot.

This, then, would show that 100 cubic feet of gas burnt had deposited ·012 grain H_2SO_4 on one square foot of surface, or rather more than was found on the cards. The box was taken from another shop than the one from which I obtained the show cards, but the same Company's gas was used in each, and I should mention that upon examination I found that a perfectly new show card, similar to those I had previously tested after they had been exposed, contained no acid of any sort.

Both these shops were exceptionally well ventilated, and I am of opinion that the greater part of the acid was deposited with the moisture condensed by the cooling of the room, consequent upon turning out of the gas and closing the door at the end of the day.

I obtained from an old-established library, where but little gas was burnt, 8 octavo volumes which had been upon an upper shelf for a space of about 3 years. The books *were* well-dusted and carefully sponged with water, but I could not by these means wash

the whole of the acid off the face of the bindings, as I found after sponging six times that they were still strongly acid to test paper. The dust was added to the washings, boiled, filtered, and in the filtrate was estimated the free and combined sulphuric acid.

Result, Total $H_2 SO_4 = 4{\cdot}76$ grains.
Free do. $= 1{\cdot}37$ „

Some dust merely shaken off, eight other octavo volumes from the same shelf, gave

Total $H_2 SO_4 = 2{\cdot}1$ grains.
Free do. $= {\cdot}441$ „

so that the greater part of the acid is absorbed into the leather.

This dust was very hygroscopic, and when washed and dried, appeared exactly like powdered charcoal, in fact, presenting all the appearances of organic matter, subjected to the action of sulphuric acid.

I also examined dust from cellars where no gas or coal fires had been burnt, and found it quite neutral to test paper; containing only a trace of combined $H_2 SO_4$.

I conclude from these results, that the atmosphere of a room becomes charged with the vapour of sulphuric acid in proportion to the amount of gas burnt, and the means of ventilation in use; that this acid is condensed with the moisture upon the cooling of the room, and the weak acid so deposited is deprived of its water when the room is again heated, so becoming concentrated, the process being repeated day after day, until the acid is in sufficient quantity to damage anything exposed to it, and even as instanced above to char it.

In favour of the theory that sulphuric acid *per se* is produced by burning gas containing sulphur, and not by the oxidation of sulphurous acid after admixture with the air, I may mention the following experiment, which, apart from the application, is curious in itself.

The glass chimney of the "Sugg's London Argand," is, when in use, more quickly covered with a deposit on its interior surface than other argands. This fact has been noticed by many, and I have heard several theories as to its origin, the more general being that it is due to the mineral matter or ashes of the suspended particles contained in the air supplied to the burner. If this were so, the same would be observed in other argands.

In order to ascertain the composition of this incrustation, I left a chimney on a burner consuming about one foot per hour for two months. I noticed that the deposit first appeared as an opaque coating extending up the chimney a distance of about one inch, the base being on a line with the upper edge of the cone. The deposit increased in thickness until it covered the same space with innumerable transparent globules, which, in time, decreased in number and increased in size. These globules were evidently in a molten condition, as on cooling they became opaque and hard, whereas when hot they were transparent and soft. They proved to be highly deliquescent, very strongly acid, and on analysis gave results showing them to be stannic sulphate.

The amount collected was nine grains; I need hardly say the tin was derived from the cone of the burner.

Here, then, is sulphuric acid found, where it would be least looked for, condensed on a very hot surface, and close to the base of a flame, that is to say, where combustion is admittedly not so complete as at any other part of the flame.

ON THE PRODUCTS OF COMBUSTION OF COAL GAS.

By G. W. Wigner, F.C.S.

For many years past this question has been thoroughly misunderstood. No doubt this may seem a very sweeping assertion, but when I find statements made by an eminent gas engineer, who is an ex-manager of gas works, that the question of the sulphur in gas is simply ridiculous, because sulphuric acid "could not be formed and is not formed," the matter becomes of some importance to meet and answer, and when further, this gentleman says in reference to the formation of sulphate of copper and sulphate of zinc caused by the burning of gas, "it is ridiculous," it is clear that there is reason to ventilate the subject.

Now what are the actual facts? Gas, as originally produced from the retorts, contains at least two different and distinct forms of sulphur impurities. One of these is unquestionably sulphuretted hydrogen, as is shown by its action on lead paper and other tests; the other is either bisulphide of carbon or a closely allied substance. Oxide of iron entirely removes the former, *i.e.* sulphuretted hydrogen, but for the removal of the bisulphide of carbon the use of lime in some form or other is essential, and it is also essential that this lime should be used in a judicious and careful way. The contention of the gas companies throughout has been that the products produced by gas containing sulphur in the second of these forms, did contain sulphurous, but not sulphuric acid, while the contention of those who have thoroughly investigated the matter has always been that the product was sulphuric acid.

I have recently carried out a series of experiments, and investigated the question, and will, as briefly as possible, describe them. I may state at once, that I do not at all doubt that just at the instant of ignition of the gas, and in the actual zone of the flame itself, a certain amount of sulphur has been burnt into the form of sulphurous acid only, so that if, for example, the products are drawn from a spot only half way up the chimney of an Argand burner, sulphurous acid will be found present, but this is hardly to be wondered at, when we consider that the combustion of the gas has reduced the oxygen present in the air by some five or six per cent., and replaced it by a corresponding quantity of carbonic acid. It is scarcely likely that oxidation could go on under such circumstances as these, but the moment these products of combustion *leave* the chimney of an Argand, or the globe of an ordinary batswing burner, oxidation again sets in, promoted largely, no doubt, by the amount of aqueous vapour present in the air, and the sulphur is oxidized into sulphuric acid, and becomes still more injurious in its effects.

Having referred to the matter in this general way, I will now consider it in the special light of the experiments I have carried on, to prove the correctness or otherwise of these deductions. The experiments were mostly tried in a room which was 10-ft. 6-in. high, and had nearly 2,000 cubic feet capacity. The room had been ventilated by means of an ordinary Arnott's ventilator, having an area of 36 square inches, but instead of continuing the ventilation through this, a series of plate glass tubes about 16-ft. long and of the same area, viz., 36 square inches, were constructed, and the ventilation was allowed to take place through these tubes. This was effected by carrying the tubes round two sides of the room, so as to put the opening of the ventilator in a position nearly opposite to the old position of the Arnott's ventilator, over the fire place,

and in order to prevent any obstruction to the draft the ventilator was changed from a natural one into an artificial one, *i.e.*, instead of taking place from the lower specific gravity of the heated air, it was artificially forced by means of a small jet of steam in the chimney, and regulated to such an extent as to keep the room during the experiments at a temperature fairly accordant with the number of burners going. The fire place was stopped up during the experiments. These tubes to which I have referred, and which formed, in fact, the ventilator of the room, were then used as follows:—The first tube, which was about 5-ft. long, was surrounded with ice so as to cool the escaping air, and condense, as far as might be, any condensible vapour which existed in the products of combustion, and the cooling effect was sufficient to bring the air at the end of this first tube to an average temperature of about 80° F: the products of combustion thus having been drawn from a level, some three inches below the ceiling, at a temperature of nearly 100° F. The next tube, of about 4-ft. in length, was used to contain various articles, such as pieces of colored silk and other dress materials, which were exposed to the current of air in order to test the effect which was produced upon them, and this tube also contained a number of pieces of test papers of different kinds (which I shall refer to afterwards), in order to ascertain whether sulphuric or sulphurous acid was given off. The next four tubes were each of short length, and were filled with glass bubbles kept moistened with water, or with solutions of alkalies or baryta salts, so as to absorb any sulphuric or sulphurous acid which might have been given off; while the last tube of all contained an air meter, so fixed as to register the exact quantity of air which passed through the apparatus, or in other words the amount of ventilation of the room. There was practically no escape for the air from the room, except that which took place through this apparatus, and the only way in which the products of combustion could escape condensation was by their passing too rapidly through the tubes, and consequently still existing in a state of vapour instead of being absorbed.

I carried on the experiments under extremely varied circumstances, sometimes using three ordinary fish-tail burners, which would be a good average amount of light for a room of such a size; on one or two occasions using eight burners of various kinds, some Argand and some batswing; on one or two other occasions using only one burner, and not consuming more than 4-ft. of gas per hour. In every case the gas was tested during the whole time the experiment was going on, by the Referees sulphur test, to ascertain the amount of sulphur which it contained, and the gas was supplied to the burners through an independent meter, so that the quantity of gas burned was accurately known. The amount of gas consumed during each experiment varied from 34-ft. to 350-ft. The gas tested was of varying quality; sometimes the sulphur in it was as low as nine grns. per 100 cubic feet, while, in one case, it ran up to 18½ grns. per 100 cubic feet. The burners which I used were, as I have said, of all kinds, Argand, batswing, and fish-tail.

The experiments therefore resolve themselves into this:—That a room was ventilated, artifically it is true, but in the ordinary way, viz., at the ceiling, and at the ordinary speed—and that the air escaping from the ventilator was cooled and tested.

I now come to the results of my experiments. First as to the sulphurous acid; during the whole of the experiments a piece of iodide of starch paper was exposed to the effects of the products of combustion, of something like 6,000 cubic feet of gas, and at no one time was there any discoloration of it, that is, it was exposed for about 180 hours to the products of combustion of ordinary coal gas, ranging from good to inferior

quality, passing through a small tube, and yet there was never sufficient sulphurous acid to tint it in any way, although part of it was continually kept moist. Another piece of the same paper, prepared in the same way, was in twenty seconds tinted to a heavy blue tint, by the combustion of only 5 grs. of bisulphide of carbon in a room of similar size. I am, therefore, quite justified in saying, that whatever the products of combustion may be, while they are within the chimney or globe of the gas burner, yet that the moment they are discharged into the room itself, the sulphurous acid which may have been produced, is entirely oxidised and sulphuric acid is the result.

Having obtained this result, I will now consider the question of the amount of sulphuric acid which can be recovered from these products of combustion, and looking at this it must not be forgotten that sulphuric acid, like all other liquids, is volatile even at ordinary temperatures, and consequently exists in the air in a state of vapour, which even at low temperatures it is extremely difficult to remove or absorb. In the worst of my experiments, while burning in the experimental room six large burners which consumed an average of nearly 40-ft. of gas per hour, I succeeded in recovering in the form of sulphuric acid 22 per cent. of the total sulphur present in the gas, a very considerable proportion of which was present as free and not combined sulphuric acid, while, in the best of my experiments, when I was burning only 15-ft. of gas per hour, *i.e.* lighting the room in the proportion in which an ordinary dining room would be lighted, I succeeded in recovering as sulphuric acid more than 62 per cent. of the total quantity of sulphur present. Therefore nearly two-thirds of the sulphur was formed into corrosive acid, and, in my opinion, it is not only justifiable, but right to assume that the air passing away through these tubes, carried off in the form of vapour the remaining one-third as sulphuric acid vapour.

It now becomes important to see to what extent these results are corroborated by other experiments which have been made in order to prove an opposite supposition. I would, first of all, say that the result of the exposure during the whole time of the iodide of starch paper proves that there was no sulphurous acid, and that, therefore, all we have to consider is, whether my experiments as to the production of sulphuric acid are capable of corroboration, and I think they are.

I find, for instance, from some evidence which Dr. Odling gave in an earlier part of this year, that, burning gas containing 33 grains of sulphur per 100 cubic feet, at the rate of 15 cubic feet per hour for 5 hours consecutively, in a room having a capacity of 3,800 cubic feet he found at a height of 1-ft. 6-in. from the ceiling, ·160 of a grain of sulphur per cubic foot of air; at a height of 5-ft. 6-in. from the ceiling, ·056 of a grain per cubic foot; at a height of 3-ft. 6-in. from the floor, ·59 of a grain per cubic foot. If we take the mean of these results, multiply them by 3,800 cubic feet, *i.e.* by the capacity of the room; this would amount to as much sulphur in the form of sulphuric acid as would be produced by gas burned for 40 consecutive minutes; in other words, if the ventilation of the rooms were so bad that the air was not changed more than once in 40 minutes, Dr. Odling would have succeeded in finding the whole of the sulphur which would have been given off by the combustion of the gas.

Dr. Stevenson and Dr. Russell also obtained very similar results; their experiments were of a different kind, and took the form of hanging plates upon the wall in order to ascertain how much acid condensed upon the surface of the plates. Some of the plates *were clean glass* ones, and some were moistened with an alkali, but when we calculated

these results, we found that in Dr. Stevenson's drawing room, the area of which is about 3000 cubic feet, the amount of sulphuric acid deposited on the walls of the room is about 9·4 grains per hour, or according to his figures 42 per cent. of the total quantity of sulphur present in the gas burnt. A more striking confirmation of the presence of sulphuric acid in the products of combustion can scarcely be wanted. It is quite clear, therefore, that whether the injurious effects of sulphur in gas have or have not been overrated, sulphuric acid is the product which is formed during the combustion.

ARSENIC IN TAPERS.

By Professor Church.

The tapers, which were the subject of the present inquiry, were in the form of slender spills for lighting, and consisted of a few threads coated with wax. They were 11¾ inches long and weighed about 16 grains apiece. The strong garlic odour which they evolved on being burnt, the pronounced lavender colour of the mantle which enveloped their flame, and the smokiness of that flame, seemed to indicate that these tapers owed their vivid green colour to a very liberal dose of a well-known arsenical pigment. The following results of chemical analysis amply confirmed this prevision.

Two tapers together weighing 2·0914 grams were taken. They had been cut up into short lengths. The wax was removed by means of carbon disulphide, the residue was treated with strong ammonia and the solution filtered. Hydrosulphuric acid was now passed through the ammoniacal liquid until no more copper sulphide was precipitated. The curd having been filtered off, the filtrate was made acid with HCl and the $As_2 S_3$ thus thrown down was collected, and then oxidized by nitric acid into arsenic acid. By addition of ammonia and 'magnesia mixture,' a precipitate of ammonia-magnesium arseniate was obtained. Assuming that this salt, dried at 100°C, has the composition ($Mg NH_4 As O_4$), aq. the ·0785 gram weighed would represent ·031 gram of metallic arsenic. This amount equals 1·48 per cent. on the original tapers. Translated into white arsenic this corresponds to 1·905 per cent.; or, in other words, every taper of 16 grains contains nearly one-third of a grain of white arsenic. Surely the use of emerald green and similar arsenical pigments for colouring tapers should be abandoned. And the same compounds are constantly used for covering paper lamp and candle shades, and with the result, through scorching, of volatilizing or detaching the arsenical poison.

POISONING OF FOURTEEN MEN BY SUGAR CONTAINING ARSENIC.

In the Analyst for August, an account was given, copied from a Glasgow newspaper, of the alleged poisoning of fourteen of the crew of the ship "Crown Prince," on her voyage between Lancton and Callao. In the course of the voyage six of the men died, with all the symptoms of irritant poisoning, but the cause of their death was not ascertained at the time. On the arrival of the vessel in Glasgow, however, a Board of Trade Inquiry was held, the result of which was that a report was made to the Board of Trade Authorities in London, to the effect, that in the opinion of the officials who conducted the Inquiry, the illness and death of the men had resulted from the use of unsound pork, a barrel of which had been opened, and a portion used, shortly before

the first symptoms were noticed. Before the Inquiry opened, however, the owners of the vessel had requested Mr. Tatlock, one of the Public Analysts for Glasgow, to examine some sugar which the Captain (Cochrane) suspected was the cause of the illness and death of the men; the result was that 13½ grains of arsenious acid were found in one pound of the sugar, which was duly reported, and the report was furnished to the officials who held the enquiry, but the fact did not seem to influence them in their opinion. In consequence of their report, Mr. Tatlock communicated with Mr. Anderson, M.P. for Glasgow, who saw Mr. Stanhope, Secretary of the Board of Trade in London, and he at once telegraphed to Glasgow, and indicated that the Inquiry would probably be re-opened.

Shortly afterwards the Captain was apprehended on a charge of culpable homicide, or neglect of duty, by supplying unsound pork to the crew, and thereby causing their illness and death, and was tried at the Circuit Court, before the Lord-Justice-Clerk, at Glasgow, on the 13th September last. Several of the crew gave evidence to the effect that some rancid pork had been served out to them on a particular day, and that they were afterwards seized with sickness and vomiting of a violent and protracted character, and while some of them said that they considered the pork to have been the cause of their illness, the steward said that he never suspected the pork.

Professor Ferguson, (Chemistry), Glasgow University, and Professor Maclagan, (Medical Jurisprudence), Edinburgh University, were called for the Crown, and corroborated the presence of arsenic in the sugar; and Dr. Dunlop, (Surgery), Anderson's College, Dr. Moore and Dr. Johnstone gave it as their opinions, that the symptoms and the appearance of the men (some of whom were so paralysed in their lower limbs, that they were permitted to sit in the witness-box,) distinctly indicated blood poisoning by unsound meat. Dr. Maclagan, however, was so clearly and emphatically opposed to this view, and gave his evidence in favour of the probability of arsenical poisoning, with so much force and precision, that Lord Moncrieff after consulting with the Advocate-Depute, said it was impossible, after hearing Dr. Maclagan, to go on with the case, and instructed the Jury to return a verdict of "Not Guilty."

ABSTRACT OF A PAPER ON THE CONSTITUENTS OF THE IVY.— "HEDERIC ACID."

By Robt. H. Davies, F.C.S.

Read before the British Pharmaceutical Conference at Plymouth.

At last year's Conference in Glasgow, I had the honour, in conjunction with Mr. C. H. Hutchinson, of reading a paper in which some of the leading characters of so-called hederic acid were mentioned. Some little additional work having been done upon this substance during the past year, I proceed to report upon it. As already stated, so-called hederic acid consists solely of carbon, hydrogen, and oxygen. Three analyses have already been published of this body—two in 1849 by Professor Posselt, to whom we owe its discovery, and one in April, 1875, in Dr. Hartsen's paper on "A New Substance in Ivy Leaves." This new substance I last year showed to be identical with Posselt's hederic acid.

I have found it exceedingly difficult to burn "hederic acid" completely by the *combustion* process. When oxide of copper is employed I have never succeeded in

converting the whole of the carbon into CO_2. With chromate of lead better results have been obtained, but the method finally adapted was to mix the substance with a mixture of chromate of lead and bichromate of potassium in a tube, the fore part of which for 6 or 7 inches was filled with dry copper oxide. By this means I have obtained results which compare favorably with those obtained by burning the weighed substance mixed with granular oxide of copper in a stream of oxygen.

The following table indicates the percentages obtained in five experiments. The first three being combinations with granular oxide of copper, in a stream of oxygen, and the two last with a mixture of chromates.

	I.	II.	III.	IV.	V.	Average.	Theory for $C_{16}H_{26}O_4$
Carbon	67·88	67·37	68·03	67·41	67·63	67·66	68·08
Hydrogen ...	9·33	9·24	9·16	9·19	9·43	9·27	9·22
Oxygen ...... (by difference)	22·79	23·39	22·81	23·40	22·94	23·07	22.70
	100·00	100·00	100·00	100·00	100·00	100·00	100·00

The percentage of carbon is greater in every case than was obtained by either of the experimenters before alluded to,* an error on their part which I think due to the difficulty of completely burning the substance.

Attempts to produce salts of barium, calcium, potassium, sodium, aluminum, copper, and silver, have been attended with uniformly negative results; and I have no reason to doubt that my former statement that this substance is not an acid is correct. An ammonium compound has been produced, but the amount of ammonia is so small as to preclude the probability of its being an ordinary salt. It is now under investigation.

ABSTRACT OF A NOTE ON HEDERIC ACID FROM IVY LEAVES.

By Charles T. Kingzett, F.C.S.

Read before the British Pharmaceutical Conference, at Plymouth.

Hederic Acid, when pure, is a snow-white powder, insoluble in ether, but soluble in hot alcohol. That specimen which formed the subject of the present paper, was kindly given to the author by Mr. R. H. Davies, and amounted to several grams only. When Mr. Davies read his paper, I suggested that hederic acid was a body constructed on the type of a saccharide, inasmuch as I had found many bodies of this constitution to give, with strong sulphuric acid, a purple colour, like to that given, as Posselt found, by hederic acid, and because this substance gives, on boiling with dilute sulphuric acid, a solution which reduces Fehling's copper test.

Since the time mentioned, I have, in conjunction with my friend Dr. H. W. Hake, published an account† of a number of new reactions in organic chemistry, similar to the one above-described, due to hederic acid, and in the continued prosecution of this study, I have subjected this last-named body to a closer examination.

When heated on platinum foil, hederic acid melts to a colourless oily-like substance, which emits a dense white aromatic and inflammable vapour, and on continuing the heat, the whole of the substance boils away in this manner, leaving no ash and no charcoal.

* In Hartsen's paper the numbers are C 63·44 per cent., H 10·4 per cent. Posselt gave 66·49 and 66·43 per cent. carbon, 9·5 and 9·41 per cent. hydrogen.

† "On some new Reactions in Organic Chemistry and their Ultimate Bearings." *Pharm. Journ.*, May 12th, 1876.

As already stated, it strikes with strong sulphuric acid a purple colour, which does not form immediately; but this colour is not nearly so intense or so beautiful as that which is immediatly formed when a trace of sugar is present, or more faintly when a drop of water is added; furthur addition of water causes the destruction of this colour.

An attempt was made by the writer to isolate sugar from the molecure of hederic acid by boiling it for a long time (twenty hours) in contact with a two per cent. solution of sulphuric acid. No visible change occurred, but the solution contained a substance much resembling sugar in its properties. The sulphuric acid was removed by baryta water, and the excess of this by carbonic anhydride, and on evaporation of the filtrate to dryness it left a sticky transparent barley-sugar-like mass, possessed of the following characters:—

It contained barium.

It gave with camphor and sulphuric acid the purple colour which Hake and I have shown sugar to produce.

Its aqueous solution reduced Fehling's test readily, and also nitrate of silver.

Strong sulphuric acid charred it in a manner resembling the action of the acid upon sugar.

After drying at 100° it admitted of pulverization.

I have no doubt that the body represents an intermediate state occurring in the spontaneous change of glucosate into glucinate of barium. Of its sugar-like character, however, there can be no doubt.

THE ACID OF WILLOW BARK.

By D. B. Dott.

From the Pharmaceutical Journal.

The chemistry of the willow seems to have been little studied, and what attention it has received has been almost entirely devoted to its active principle, salicin. All the information I have been able to obtain regarding the constituents of the bark is very meagre, the majority of works on chemistry and materia medica merely mentioning that salicin is extracted therefrom; while, curiously enough, the 'Pharmacographia' of Flückiger and Hanbury omits all notice of the subject. Neligan states (authority not given) that the bark contains resinous matter, gum, chlorophyll, tannin, an organic salt of magnesia, and salicin; and that is as complete an account as I have found in any of the other books.

When an infusion of willow bark is made, the liquor is distinctly acid to litmus. In the preparation of salicin by Erdmann's process this acid is neutralised by the excess of lime, and the salt thereby formed passes into solution. On evaporating to dryness and exhausting the residue with spirit the salt is redissolved and remains in the spirituous solution after the salicin has crystallized out. The salt may be obtained by distilling off the spirit and allowing the residue to crystallize. These crystals are then purified by recrystallization from water. Thus prepared the lime-salt separates in the form of a cauliflower-like mass composed of radiate groups of prismatic crystals.

A portion of these crystals when heated fused, and inflamed, left a residue of calcic carbonate, indicating an organic salt of lime. It was found that the substance lost weight but slowly in the exsiccator, and likewise in the water-bath. A portion of the

air-dried salt was therefore dried in the air-bath at 130° C. 9·140 grs. lost 2·745 grs. = 30·03 per cent. In another determination with a different crop of crystals 7·85 grs. lost 2·275 grs. = 28·98 per cent. A quantity of the salt was then incinerated in a platinum crucible, the residue being treated with excess of sulphuric acid and the crucible again ignited. 6·41 grs. gave 4·00 grs. $CaSO_4$ = 1·176 grs. Ca = 18·34 per cent. In the second determination 6·12 grs. gave 3·82 grs. $CaSO_4$ = 1·12 grs. Ca = 18·35 per cent.

One or two methods for preparing the acid were tried, the following being the process finally adopted :—To a solution of the lime-salt in water solution of oxalic acid is added—not in excess. The precipitate is then separated by filtration, the filtrate concentrated and extracted with ether, which dissolves the acid. The ether being now driven off, a syrupy solution of the acid is left. A few ounces were prepared by this method and placed over sulphuric acid under a bell-glass for two days. The acid then remained in the form of a syrup, almost odourless, with an intensely sour taste. As in these respects it exactly resembled lactic acid, and seeing that the calcium salt in its crystalline form and in its percentages of H_2O and Ca corresponded with calcic di-lactate, there could be little doubt that the acid under examination was lactic acid. To make more certain, however, some further tests were applied. A little was heated in a test-tube, when water and carbonic anhydride were given off, and a residue left which shortly solidified. A portion was then boiled with sulphuric acid, which liberated an inflammable gas burning with a blue flame—no doubt carbon monoxide. When a small quantity was heated with sulphuric acid and manganese dioxide, a vapour smelling like aldehyde was evolved. A portion of the acid was distilled and the fraction coming over and above 130° C. was evaporated and treated with cold alcohol, which separated small white crystals, having the form of rhomboidal plates, and in other respects resembling lactide.

From the acid as above obtained the zinc-salt was prepared by warming with excess of zinc carbonate, filtering, and allowing to crystallize. The crystals were pressed between blotting paper and exposed for a short time to the air. In these air-dried crystals the H_2O was determined by drying in the water bath; 6·065 grs. lost 1·125 grs. = 18·46 per cent. In a second determination with another crop of crystals 9·275 grs. lost 1·695 grs. = 18·27 per cent. The zinc was determined in the dry salt by ignition in the blow-pipe flame; 6·33 grs. gave 2·12 grs. ZnO = 33·49 per cent. In another determination 7·58 grs. gave 2.55 grs. ZnO = 33·64 per cent.

The above numbers are here compared with those calculated for the normal calcium and zinc salts of lactic acid respectively—

$Ca(C_3H_5O_3)_2.5\,H_2O$.

		Found.		
	per cent	I.	II.	mean.
H_2O . . .	29·22	30·03	28·98.	29·505
Ca . . .	18·34	18·34	18·35	18·345

$Zn(C_3H_5O_3)_2.3\,H_2O$.

		Found.		
	per cent.	I.	II.	mean.
H_2O . . .	18·33	18·46	18·27	18·36
ZnO . . .	33·38	33·49	33·64	33·56

The ZnO is too high, owing either to an impurity in the salt, or to a fault in the analysis;

but I had not time to examine into the matter. The zinc-salt crystallized in four-sided truncated prisms, which were insoluble in alcohol.

I am unable to state from what species of *salix* the acid was prepared, but as all the samples of bark I have examined give acid infusions, it is not improbable that lactic acid exists in all the members of the Salicaceæ.

CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

To the Editor of "The Analyst."

Sir,—With your kind permission, I should like to be allowed to make a few remarks on the following questions:—Firstly, as to the so-called castor oil pills. That the sale of a pill under the name of a substance of which it does not contain a trace is a fraud, and a very mischievous one, seems such an obvious truism, that one can scarcely understand how it can be disputed. Since the first prosecution regarding the sale of castor oil pills, without castor oil, has taken place, I have asked a number of persons, educated as well as uneducated, what they imagined the chief active principle of their castor oil pills to be, and was in every case informed that they bought them because they believed them to contain castor oil, or perhaps a concentrated extract of the oil, retaining all the active principle. The defenders of the practice of mis-naming pharmaceutical preparations, who bring forward numerous cases to prove the generality of the practice, all ignore the gravest feature of the case, independently of the fact that two wrongs do not make a right, viz., that these pills are sold as a purgative, and are sold under the name of a well-known and highly appreciated article, unfortunately, however, somewhat unpleasant to take. Persons, therefore, who like the action of the oil, but not the taking of it, buy these pills, and are miserably taken in. The proposal of some pharmacists to add a trace of castor oil, and call the pill compound castor oil pill, is so utterly contemptible, that I can only express my astonishment at the length to which some trades-people seem willing to go.

Secondly, as to the question of peas coloured by copper. I must confess that I had hoped Messrs. Paul and Kingzett would of their own accord withdraw their hasty conclusions as soon as they saw the very poor show their experiments made in print. This, however, is obviously not their intention, and they actually seem to imagine that they have settled the question once for all in favour of the coloured peas. Could there be a more glaring instance of the unscientific use of the imagination. How could they venture to draw any serious conclusions from their few experiments, in which they have not even taken the trouble to estimate the total quantity of copper they took, nor the quantity of the metal passed by the bowel, and when they know absolutely nothing about the quantity of copper which, when absorbed into the system, proves injurious to various constitutions? But it is really waste of time to criticise such work as this, and I trust that no Public Analyst at least will be misled into the belief that peas coloured by copper have been in any way proved to be non-injurious.

Copper seems to be one of those substances which, like arsenic, mercury, lead, opium, &c., &c., act with very different intensity on different constitutions, or under different conditions. Some persons can withstand the injurious effects of quantities of these substances which to others would be absolutely fatal, while some are sensitive to the action of quantities which we can only call infinitesimal. How much lead, for example, will find its way into the system of a person exposed to the exhalations from freshly-painted surfaces for a few hours, or how much arsenic into the system of one staying for a few hours in a room, the paper of which is coloured by arsenical green? And yet we know that both these conditions sometimes produce characteristic symptoms of lead or arsenic poisoning. Now, although copper does not seem as active under any conditions as either lead or arsenic (although even this is doubtful), many of its compounds are undoubtedly poisonous, and it appears to me utterly unjustifiable to defend such a practice as the colouring of peas by means of copper on the strength of a few rough experiments such as those of Messrs. Paul and Kingzett.

In conclusion, a few words as to the question raised in Dr. Morgan's letter in your last issue. I can scarcely believe that the certificate of Messrs. Bell, Bannister, and Helm has been quoted correctly. As is well known, chloride of sodium had been put into the schedule of prohibited articles in the Licensing Act of 1872. This, as was natural, created some commotion among brewers; they petitioned Government, and, after a prolonged inquiry, the addition, or rather the presence in all, of 50 grs. of chloride of sodium per gallon was permitted. This is absolute proof that no English beer or ale of any consequence, at that time at least, contained naturally more than this proportion of common salt. It is extremely unlikely that the Burton supply has, since then, entirely changed its character. Yours, &c.,

October, 1877. A. DUPRÉ.

To the Editor of "The Analyst."

Sir,—Your letter of yesterday to our Directors has been handed to me. In answer, I assert and assure you that no ales leave this brewery containing 20 grains of salt per gallon. The waters used here contain from 5·10 grains to 5·35 grains chlorine per gall., and in no case is their a concentration to one-half. Salt is not used, or any matters to form it.

We are aware a little may be added from the malt and hops used. Consequently I cannot err much in my report of this day on a strong beer, having had more than usual amount of concentration, containing 15·60 grains per imperial gallon.

I am, Sir, faithfully yours,

WILLIAM KIRK.

23rd October, 1877. *Chemist to the Burton Brewery Company.*

LAW REPORTS.

ADULTERATION OF GIN.

At Bow Street, William Birrell, landlord of the Two Brewers, 164, High Holborn, lately appeared to an adjourned summons, before Mr. Vaughan, charging him with having sold gin, which was not of the nature, substance, and quality of the article demanded. Mr. J. H. Jones, prosecuted, and Mr. Child, solicitor to the London Licensed Victuallers' Protection Society, defended. The facts were these:—On the 11th of July last John Hoyle went to the appellant's house, and, seeing him, asked for a bottle of gin for 2s., to which request the appellant answered that he had no bottles, that he had gin at three prices, upon which Hoyle said that he would take the cheapest, which cost 2s. 1d. He then received a bottle. He then said that he was an inspector under the Sale of Food and Drugs Act, and that he had purchased the gin for the purpose of having it analysed. Opening the bottle, he divided the contents into three parts, which he poured into three smaller bottles. Having sealed these, he left one with the appellant and the other two he took away with him. One portion, which was taken to Professor Redwood for analysis, was found to be 42 under proof, or, in other words it consisted of 58 proof spirits and 42 of water.

Mr. Thomas Arthur Smith, collecting clerk in the employ of Messrs. Tanqueray, gin distillers, of Vine Street, Bloomsbury, proved that the spirit when it was sent out by the firm was 17 under proof. Water and sugar were always added before the spirit was retailed. Mr. Child submitted that the question became what was the practice of the surrounding neighbourhood. If he went to Bond-street, he would expect to pay more than in Drury-lane. Mr. Vaughan said he did not see that at all—at least, not in a question of gin or gin and water. That was a contention *ad absurdum*. He asked witness at what price the gin (17 under proof) was sold to the defendant. Witness said the price of the gin was 12s. 11d. a gallon, and there were about six bottles to the gallon; about 2s. for a pint and a-half. Mr. Child said that of course the defendant could not sell it at the same price. He must consider his expenses, the cost of preparing it, and sweetening it for the public taste. Then there was also the style of the place. Mr. Vaughan said he did not take that into consideration. Mr. Child submitted that this was a place of entertainment, open to the public, and they ought to pay for the lights, the decorations, and the accommodation. If he went into a very smart shop, he would know that he had to pay for the extra smartness of the place. Mr. Vaughan said he could not take into consideration the beauty of the barmaids, the respectability of the barmen, or the cost of the lights and decorations; all those things were for the purpose of enticing a number of flies to the place. There the lights were, and the people swarmed round them. The question was, was a quantity of water put in to fraudulently increase the measure of the gin. There were two ways for a publican to act in. He could mix water to any extent that he liked, and the more water he put in, the better it would be for the public, but then he would have to say, "This is reduced 60 per cent.;" or he must say, "This is a wonderful gin, not watered at all, and I shall sell it you for 2s. 6d.," and so put his profit into his pocket that way. Then there was evidence that the gin sold at other places was not watered to the extent that the defendant's had been. In one instance, the gin was simply 32 under, and in another 31½, but the defendant's was 42. Mr. Child submitted that at the price the gin was sold at, this reduction was was not to the prejudice of the purchaser. Mr. Vaughan said not to the prejudice of his stomach, no doubt, but it was to his pocket. The purchaser might sweeten and dilute his own gin to his own taste. Mr. Child had, as usual, fought the case with great obstinacy, and said for his client everything that could be said; but having carefully considered the case and studied the Act of Parliament, no conclusion except one adverse to the defendant could be come to. Mr. Child submitted, in mitigation of damages, that this new application of the Act of Parliament had come upon licensed victuallers by surprise. The Act formerly specifying certain things that were not to be done had been repealed, and the licensed victuallers had been thrown in the general Act that affected all the public. He should also ask Mr. Vaughan to send the case by appeal to the Quarter Sessions, as it was a matter of great importance to publicans to have the matter decided. Mr.

Vaughan said he did not care whether the case went to the Quarter Sessions or to one of the Superior Courts. He should have thought one of the Superior Courts would have been better. He would grant a case for the law of the matter to be argued, or the defendant might appeal. Mr. Child decided to appeal, and said he now left the case in the hands of the magistrate.

Mr. Vaughan said he entertained no doubt but that the defendant had brought himself entirely within the provisions of the Act of Parliament—that is to say, had sold an article which had been adulterated with water to an excessive extent for the purpose of fraudulently increasing the measure of what was represented to be gin. The question really was, whether it was necessary to give the spirit a commercial character to reduce it or water it to this extent. He had no doubt but that it was not. The penalty the defendant had made himself liable to was £20; he mitigated that to £5 and costs. There was a second summons for the same offence against Mrs. Hitchin, of the "White Hart," 191, Drury Lane, but in this case the added water was to the extent of 48 under proof. Mr. Vaughan allowed the case to stand over till after the decision of the appeal, and said that all the publicans had to do was to label the bottle.

The appeal in connection with the above case was heard on October 20, before Mr. P. H. Edlin, Q.C., the Assistant-Judge; Mr. Hughes-Hughes, Mr. D. Hill, Mr. C. H. Campbell, Mr. Walshe, Mr. Bickerstaffe, Mr. Halswell, and Mr. Ritchie, M.P., Justices.

Mr. Besley and Mr. Child were counsel for the appellant; Mr. Poland and Mr. Croome were counsel for the respondent. Mr. Poland, having stated the facts, argued that Hoyle had asked for gin, and obtained not gin, but gin and water, as gin so weak as this was never supplied by the rectifier to the publican. In this case the water must have been added by the publican, who had no right whatever to dilute his gin with water and then sell the mixture under the name of gin. The distiller prepared the raw spirit, which afterwards, according to the provisions of the Act of Parliament, went into the hands of the rectifiers, who made it into the merchantable article called gin. The raw spirit was changed into the merchantable article by reducing it, mixing it with juniper berries and other ingredients, and by distilling it. The gin could be made of any strength the rectifier pleased, but it was generally 17 to 22 per cent. under proof. It would be contended that as there was no standard as to the quality of gin the publican had a right to sell weak gin, but he argued that directly the publican added water to the gin it ceased to be gin and became gin and water. When a purchaser went and asked for a certain article, he expected to get it in the same state as it was received from the manufacturer. If gin was made by the rectifiers as weak as that which had been sold in this case, it would be a different thing; but the publican was not at liberty to add water as he pleased to gin which he intended for sale.

At the close of Mr. Poland's opening address, John Hoyle was called to prove the purchase of the bottle of gin fromthe appellant, and Professor Redwood to prove the analysis. In cross-examination, the latter stated that he could not tell whether water had or had not been added after distillation, and that there was no fixed standard strength for gin, the rectifier being at liberty to reduce his spirit to any strength he pleased. Thomas Arthur Smith, in Messrs. Tanqueray's service, gave evidence, and stated that Messrs. Tanqueray supplied the Two Brewers with gin which was 17 under proof. The quality of gin generally supplied to customers was of varying strength, from 17 under proof to 35, and sometimes under that. Gin could be supplied by Messrs. Tanqueray of any strength down to 55 per cent. under proof, and it could be called gin, though 50 under proof.

Mr. Besley, for the appellant, alluded to the practice of publicans of selling fourpenny, fivepenny, and sixpenny gin over the counter, and said that no person who went in and asked for fourpenny gin believed that he was buying gin of the same strength as that which was sold for sixpence. Adulteration, as defined by "Richardson's Dictionary" was "to debase by a foreign nature, to bring into it something that is not a natural ingredient, to destroy its integrity by that which sullies its purity." Gin, therefore, could not be adulterated with water, which was not alien to it, and without which it could not be rendered fit for consumption. Mr. Hoyle, the purchaser, had not been prejudiced. He had not asked for gin 17 under proof or 22 under, but for the cheapest gin which was sold. He got it, and where was there any misrepresentation? By reference to the Spirits Act, 23 and 24 Vict., cap. 114, it was clear that while on the one hand a *maximum* strength could not be exceeded by distiller, rectifier, dealer, or retailer, the *minimum* strength was not prescribed, and quantities of not less than two gallons could be sold at any strength. The permit for larger quantities than two gallons, which on the face of it indicated the strength was a mere Excise regulation for the collection of duty, and did not carry with it any such consequence as that further dilution after leaving the hands of the compounder altered the character of the article. It was quite as much gin when 42 degrees under proof as when it was 17 under proof, and unless the purchaser specifically asked for gin of a certain strength no offence could be committed.

Evidence was then given that the particular bottle of gin sold had been bought by Mr. Birrell, from his predecessor; that he had not in any way tested it, and that he had sold it in the same state in which he received it, believing that it was an article of the same nature and quality as two-shilling gin which was demanded. This would have been a special defence under the statute if there had been an express written warranty, but the Court intimated an opinion that in the absence of such a warranty the defence failed.

Upon the conclusion of the case the Justices retired, and on their return the Assistant Judge gave judgment as follows:—

"We think this conviction should be affirmed. With regard to the questions raised by Mr. Besley as to the construction of the sixth section of the Act, we have before us the accordant decisions of the Supreme Court upholding the convictions in two cases in which the facts were substantially the same as in the present case. It appears that it is the practice of rectifiers to add water to the rectified spirit or compound after its manufacture, so as to reduce its alcoholic strength to the degree below proof desired by the purchasers and thus there is no precise limit to the dilution it may undergo before it leaves the rectifier, although practically 35 per cent. below proof is the lowest strength for which there is any demand. But then, there is no room for fraud or deception in this mode of dealing, inasmuch as the manufacturer or rectifier is bound to specify in the permit which the Excise law requires him to give to the purchaser at the time of the sale the actual strength of the spirit or compound sold, and, of course, the price chraged varies according to the strength. There is no such check, however, upon the seller of a less quantity than two gallons, and if, in order to increase the bulk and measure, water be added and the gin reduced below the strength at which the commercial article so called is ordinarily sold and which it may be reasonably expected to possess, he must be careful not to sell the diluted compound for such article to the prejudice of the buyer, as by so doing he may incur the penalty prescribed by this enactment. No doubt, in such a case the price charged has to be considered. The evidence has satisfied us that the appellant was rightly convicted of this offence. There will, therefore be judgment for the respondent with costs."

Some of our Country Magistrates hold a different view on this subject, for:

At the County Petty Sessions at Stockton, Joseph Tynan, William Scott, Gilbert Iving, William Walton, and Mary Scott, innkeepers at Sedgefield, were recently charged with selling adulterated gin. Mr. W. R. Fawcett, solicitor to the Stockton and District Licensed Victuallers' Association, appeared for the defence. The case against Tynan was taken first. On the 15th ult., Superintendent Bell, inspector under the Food and Drugs' Act, purchased a pint of gin at the defendant's house, and had a portion of it analysed by the county analyst, Mr. Edger, who certified it to be 43 under proof. Mr Fawcett submitted that no conviction should follow if he proved that the gin in question was of the strength at which it was usually sold in the district, and quoted an opinion of Mr. Justice Mellor's in support of the contention. He then called witness to prove that gin was bought at 22 under proof, and that 20 per cent. of water was customarily added, this being the innkeepers' only way of obtaining profit. The Bench dismissed the case and the others were withdrawn.

We are glad, however, to see that this view of such glaring cases of adulteration is not general in the provinces.

At the Bishop Auckland Police Court recently, Hugh Stoker, innkeeper, of Crook, was charged with selling gin which was 49 under proof, and George Knaggs of Spennymoor was charged with selling whisky which was 29 under proof. Mr. Superintendent Henderson was the prosecutor; and Mr. Maw, was for the defence in both cases. It appeard that the prosecutor went to Stoker's house, and, after inspecting the measures, asked for a pint of gin such as they supplied to customers. Stoker drew some out of a cask they had just got in, but the superintendent declined to have any. He pointed to a cask, and Stoker drew him a pint, and told him it was gin and water. In the charge against Knaggs, it appeared that the innkeepers of Spennymoor, with the exception of the defendant and another, had agreed to raise the price of their spirits, and to sell a better article, in order to keep them within the law. The case against Knaggs was dismissed; and Stoker was fined £5 and costs, and his license endorsed.

How to Adulterate Milk.—At the Belfast Police Court lately, John Stevenson, milk dealer, residing at Ballymoney Townland, Falls Road, was summoned by William John Anderson, milk inspector, for selling adulterated butter milk. Mr. Coulter prosecuted, and Mr. Regan appeared for the defendant. It appeared that the complainant purchased a sample of the defendant's buttermilk, and forwarded it to Dr. Hodges, borough analyst, who certified that the sample contained 20 parts of water and 80 parts of milk. A witness who was produced for the defence said no water had been put in the milk; but, on being cross-examined, he said some water might have got in the cans before the milk was put into them. A fine of 40s. and 12s. costs was imposed on the defendant.

Doctored Beer.—At the Stafford Petty Sessions recently, a publican was charged by the Inland Revenue authorities with having in his possession, and adulterating beer with, grains of paradise, whereby he had rendered himself liable to a penalty of £200. The defendant pleaded guilty, and the Bench imposed a fine of £50. The popular notion that the seeds of the *Amomum melegueta* have a deleterous effect on the system is wholly unwarranted, the grains being a staple article of consumption on the West Coast of Africa, and much esteemed as a seasoner to food. If nothing worse than grains of paradise are infused into malt liquors, the consumers of such need be under no apprehension as to possible evil consequences. The pernicious adulteration of which the Excise and public should beware is the cocculus indicus. It is a

significant fact that while large quantities of this poisonous berry are annually imported into this country, the ostensible use for the same is almost *nil*. An ointment of cocculus was official in the British Pharmacopœia of 1864 (employed in certain skin affections), but is now quite discarded. It is not used in veterinary medicine in any way, and we are forced to the conclusion that the greater part received into this country is applied to illegal purposes—to "doctoring" beer and ale.—*Lancet.*

ANALYSTS' REPORTS.

Mr. J. Pattinson reports that, as Public Analyst for Northumberland, he analysed during the quarter ending 30th September, 1877, 97 samples, of which 52 were found to be adulterated, and nearly all of these adulterated ones were spirits. Thus 21 out of 26 samples of whisky were from 23·5° to 40° under proof; 23 out of 25 samples of gin were from 23·5° to 61·4° under proof, and 4 out of 5 samples of rum, were from 24·5° to 44° under proof; the adulteration in every case being by the addition of water. It is evident from this that the spirit trade in this country needs serious attention on the part of the local authorities, and we hope that after the recent decisions in appeal cases arrived at both by judges and magistrates, the authorities will not be backward in prosecuting every publican who is detected selling adulterated spirits. Four samples of flour were also found adulterated, 3 with 3 per cent. of rice flour, and 1 with 5 per cent. of maize flour.

Mr. Pattinson also reports, that, as Public Analyst for Newcastle-upon-Tyne, he examined during the quarter ending 31st August, 1877, 66 samples, of which 17 were adulterated, viz.—6 samples of preserved peas which were coloured with copper, 2 samples of milk which were adulterated with water, and 9 samples of flour, the majority of which were adulterated with rice flour.

Mr. J. W. Gatehouse, Public Analyst for Bath, reports during the quarter ending Sept. 29th, 1877, I have analysed for the inspector appointed under the above Act 38 articles of food and drink, of which 36 were pure and 2 adulterated. The articles analysed were—Butter, 4 samples, all genuine, but one of a most inferior and objectionable character; beer, 2 samples, 1 genuine and 1 adulterated with salt; bread 3 samples, all genuine; coffee, 1 sample, genuine; confectionery, 3 samples, of different colours, all genuine; milk, 24 samples, 20 genuine, of good quality, 3 of inferior quality, and 1 adulterated with water; oatmeal, 1 sample, genuine. These results compare most favourably with the preceding quarter, when, out of 31 substances analysed, 10 were adulterated. The quality of the milk has generally much improved, many of the samples being of excellent quality.

Dr. J. F. Hodges, Public Analyst for Belfast, reports, that during the quarter ending Oct. 23rd, he analysed 114 articles of food, drugs, &c. Of these 16 samples of sweet milk and 26 of butter milk were found to be adulterated; 9 samples of aerated waters contained lead or copper; a sample of lime juice syrup contained sulphuric acid, and a sample of "castor oil pills," as a matter of course contained no castor oil. In all the cases where the authorities prosecuted, convictions were obtained, and fines amounting altogether to £19 were imposed.

Mr. E. W. T. Jones, Public Analyst for Wolverhampton, in his quarterly report for Michaelmas last, states that during the quarter he examined 37 samples and found 10 to be adulterated; these were 1 sample of ginger adulterated with 25 per cent. of wheat flour; 6 samples of pill quiniæ; 2 samples of whisky were 29 and 39 under proof, and 1 sample of gin was 46 under proof.

SOCIETY OF PUBLIC ANALYSTS.

The next meeting of the Society will be held at Burlington House, on Wednesday, evening, the 14th November, at eight o'clock, when the gentlemen proposed at the last meeting, will be ballotted for, and several other gentlemen will be proposed for election.

Mr. W. Morgan, Ph.D., Public Analyst for the Borough of Swansea, has been appointed Public Analyst for the county of Cardigan.

Mr. E. W. T. Jones, Public Analyst for South Staffordshire, the Boroughs of Wolverhampton and Kidderminster, and the City of Lichfield, has been appointed Public Analyst for the Northern Division of the County of Stafford, in the place of Mr. W. L. Scott, resigned.

NOTES OF THE MONTH.

We see one of our contemporaries announces that definite steps are about to be taken with regard to the professional organisation of chemists. We thought this was done some weeks since, when application was made to the Board of Trade for a few gentlemen to have permission to register themselves as a Limited Liability Company, with special leave to omit the word "Limited," though it is a pity they did not propose to adopt it for then the title would have been unique, like the body itself. "The Institute of Chemistry of Great Britain and Ireland, LIMITED," would have had an irresistable attraction for some aspiring gentlemen of limited practice. The Institute is to consist of only 500 members, but we do not know where they are to come from, as we should have imagined that "Great Britain and Ireland" could scarcely muster more than half that number of professional chemists, however, we suppose the number is considered unlimited. We note too, that the organizers, "generally recognised as among the heads of the profession" have thought it necessary—in case the future members should consider that, though they (the organisers) may be *among*, they are not *the* heads of the profession—to appoint themselves to office for two years instead of one; we hear the appointment was unanimous. We also note that the council is to consist of 34 members, but as it originally consisted of 51, we can only suppose that like the Kilkenny cats, they have disagreed among themselves—hence the reduction in their number.

Tea analytically is coming to the fore. We not only have compressed tea guaranteed but also tea in bottles and canisters. We certainly ought now to have the "cup that cheers" pure, whether the grocer uses it as a means to the end of inebriation or not.

Lord Truro's recent letter to the *Times*, in which he deplored the adulteration of spirits because of the insobriety to which it gave rise, is very aptly commented upon by Mr. Pattinson's report, which we print in this issue. It appears that Mr. Pattinson has given special attention to spirits, and like most other analysts he finds more than 80 per cent. adulterated, but unfortunately for Lord Truro's theory, the adulterant is, as usual, always water. No doubt the publicans have found out that gin-and-water is less intoxicating than gin alone, and so, in the interests of humanity, they sell the latter article after reducing it to the extent they think desirable—or profitable.

It is rather curious to note in connection with the above, that Mr Poland, the counsel selected by the trade themselves, says, that a publican is not at liberty to dilute the gin at all: *i.e.*, if he buys at 11 u p., he must sell at 11 u.p. Rather hard lines this for some of the St. Giles's men, whose cellar room is limited.

Why does not the Aylesbury Dairy Company, or some other body of men come forward and boldly announce that the milk they sell is up to the Society's standard. The supervision which is exercised in the large dairies is quite enough to prevent watering, and then it must be so. Such an honourable and business-like step would be followed immediately by the larger dairymen, and the Inland Revenue Standard of 25 per cent., water disproved. If the Dairyman's Association try it they will succeed.

Waxed rice seems a curious thing, yet strange to say, it is now in the market. It appears that one or two per cent. of wax adds a peculiar lustre to rice, and makes it look so pretty, that the Dutch are profiting much by preparing it for the English to use. Prussian Blue is said to be added, and certainly the appearance of some samples bears out this statement.

The *Pharmaceutical Journal* waxes wroth, because the dictum of Messrs. Paul and Kingzett, as to the non-injurious effects of copper in peas is disputed. Analysts when they view the matter from one point of view only are apt to fall into such errors as those we criticised in our last number. We wonder whether even these gentlemen themselves would accept as a suitable beverage a drinking water containing copper.

We are surprised to find the same journal, expressing regret that there is no good method of butter analysis. It certainly cannot be held, that because the chemists at Somerset House fail in the manipulation of a process somewhat too delicate for them, it is a total failure. On the contrary, in good hands the fatty acids process always succeeds.

RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Southampton Row, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
691	J. C. L. Loeffler and R. W. Higgs	Electric Telegraphs	1s.
700	A. Dudgeon	Applying Asbestos for Packing Boiler Lining, &c. ...	6d.
765	M. P. W. Boulton	Producing Heat by Combustion of inflammable Gases or Vapours	10d.
818	H. J. Hargreaves	Manufacture of Sulphates of Soda and Potassa ...	6d.
827	G. Du Vallon and J. Csete ...	Refrigerating Liquids	6d.
835	G. Alsing	Treating Sewage, &c.	2d.
846	V. Collyer	Preserving Raw Meat, Lard, &c.	2d.
850	C. Pieper	Filter Presses	8d.
853	H. Parkes	Obtaining Nickel from Ores	4d.
860	J. Hanson	Treating of Sewage, &c.	2d.
879	S. B. Bowen	Manufacture of Sulphate of Iron from "Pickle" ...	4d.
1022	G. Gould	Liquid Composition for Embalming, Disinfecting, &c.	4d.
1034	H. & J. Bell and J. J. Coleman ...	Refrigerative Processes for Preserving Food	6d.
1056	W. Jackson	Treating Fabrics Printed with Analine Colors ...	2d.
1064	W. R. Lake...	Treating Sewage	6d.
1116	W. B. Brain	Electric Batteries	4d.
1120	J. Waddington and B. Longbottom	Condensers	2d.

Mr. C. O'Sullivan, Chemist to Messrs. Bass & Co., writes to us to inquire whether Dr. Morgan would inform him what he (Dr. Morgan) means by the "salt" he finds in beer, and how he estimates it.

ERRATA.—Under Analysts' Reports in our last No., it is stated that Mr. C. H. Piesse examined 525 samples during 1875-6—it should been during 1873-6.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Medical Record; The Miller; The Anti-Adulteration Review; Principles of Theoretical Chemistry, by Ira Remson, M.D.; Supplement for 1875-77 to Bernard Quaritch's General Catalogue of Books; Journal of Applied Science; The Country Brewers' Gazette.

THE ANALYST.

PURE OR IMPURE GAS.

We publish this month the reports of two cases in which gas companies supplying the metropolis have been proceeded against by the local authorities, and they differ so essentially in their features that they form a very practical commentary upon the present state of gas legislation in London. In the first case the Commercial Gas Company were summoned before Mr. Hannay, the stipendiary magistrate, at Worship Street Police Court, for having on eight different days supplied gas to the consumers containing more ammonia, and therefore being of less purity, than is allowed by the Company's Act. The case appears to have been fought out with a fair amount of energy, but in the end the magistrate considered the case proved, and ordered a warrant to issue for the full amount of penalties claimed, viz., £50 per day, or a total of £400.

In the other case, which was a far more important one, the West Ham Local Authority moved, before Mr. Justice Fry, for an injunction to prevent the Gas Light and Coke Company from carrying on business at their works in Canning Town in such a way as to cause a public nuisance. In the earlier part of the hearing the evidence was devoted to prove that a nuisance really did exist, and after one day of that kind of evidence the Company decided not to dispute this part of the question any further but to acknowledge the nuisance, and Mr. Justice Fry, in reply, said that the West Ham Board had not only proved a nuisance, but an *intolerable* one. The next step was for the Company to proceed to justify the nuisance on the ground that it was impossible to comply with the restrictions of the gas referees and supply gas containing less than 20 grains of sulphur per 100 cubic feet, unless they did create a nuisance. Mr. Vernon Harcourt, one of the gas referees, having been called, succeeded in entirely dissipating this myth, and satisfied the judge that it was quite possible for such manufacture to be carried on without any nuisance whatever to anyone outside the works. Unfortunately, too, for the success of the Gas Company's case their own witnesses proved facts which had not previously been brought out in evidence, for they showed that a considerable part of the nuisance complained of had been caused by foul lime, *i.e.* sulphide of calcium saturated with bisulphide of carbon, which had been brought from other works and deposited on the ground at Canning Town in order to raise its level and make foundations for new buildings. The result was that on this point alone the judge held that the Company had no right to moderate a nuisance in one district by transferring it into another, and that therefore they were liable to an injunction even if they had taken reasonable precautions to prevent a nuisance, which, however, he considered they had not done.

The reports of the two cases, when viewed in connection with the decision of the Parliamentary Committee, which we reported in our July number*, have a much more important bearing than might at first sight appear. The Company have now fought the matter in every way. They have gone to Parliament for permission to increase the amount of impurity which they may send out to the public, in other words to form sulphuric acid in our own rooms instead of eliminating the sulphur at their works. In one of these cases they have exceeded their Parliamentary maximum of impurity and have fought the matter to the utmost before the magistrate, with the result that they have been

* p. 67.

fined in the maximum penalty, and in the other case they have created a nuisance at their works by the process of elimination of sulphur, and after being driven, so to speak, into a corner they have acknowledged the nuisance and pleaded that they could not help it, and this plea has been disallowed by the judge.

The whole thing therefore comes to this, the London gas companies, and we regret to say some of the provincial companies as well, must now work up to the standard of purity which some of their competitors in other places have without any compulsion already succeeded in attaining. We confess we cannot see why if it is possible to purify gas without nuisance at a score of places we could name, what difficulty there can be in carrying out the same process in London or other provincial towns. The size of the works is not in any degree an element in the matter, but the fault must lie in imperfect management or carelessness in the necessary precautions.

These decisions are of immense importance. Parliament has said the public shall not be poisoned in their own rooms, and Mr. Justice Fry has decided that the public shall not be poisoned by the emanations from gas works.

SOCIETY OF PUBLIC ANALYSTS.

A Meeting of this Society was held on the 14th November, at Burlington House, Piccadilly, the President, Dr. Dupré, F.R.S., in the Chair.

The following gentlemen were balloted for and declared unanimously elected as members:—Louis Siebold, F.C.S., Manchester; Thomas Jameson, F.C.S., Aberdeen; Thomas Wm. Drinkwater, F.R.P.S., Edinburgh; and James John Day, F.C.S., Derby.

The following gentlemen were proposed for election as members:—J. R. Martin, F.R.M.S., London; J. W. Gatehouse, Bath; J. Whitla, Monaghan; and they will be balloted for at the next Ordinary Meeting.

The President said their first business that evening was rather important; the German government were thinking of introducing an Adulteration Act, but before doing so they wished to enquire in various countries how food and drugs were dealt with, and they sent a commissioner (Dr. Rottenburgh) here, among other countries, to inquire into the matter. He seemedtobe greatly impressed with the good work which the Society had been doing here, and that was certainly very gratifying, because unfortunately they usually got more abuse than praise. He (Dr. Dupré) had had several interviews with the Commissioner, who had also been to one of the Secretaries (Mr. Wigner), and they had given him a good deal of information, with which the Commissioner was so well pleased that he had expressed his wish to be allowed to submit a number of questions to the Society at large. These questions and answers thereto had been considered at one or two council meetings, and would now be laid before this meeting. There were a good number, and they would require careful attention, but he (Dr. Dupré) thought it was well worth their while to devote that attention to them. In the first place as replying to the inquiries made, and secondly because it would be a good opportunity for them to express their opinion as a Society upon the working of the Sale of Food and Drugs' Act. On the whole he thought it had worked satisfactorily, but difficulties had cropped up here and there, and some hardships had been felt by analysts which it would be advisable to correct in the future. No doubt in a short time there would be some amendments proposed in the Act, and when that time came they would be prepared to say what they wanted done.

The questions submitted by Dr. Bottenburgh, and the answers suggested by the Council, were then considered, and after a lengthy discussion, the matter was referred back to the Council for further consideration, to take what course they thought best with regard to it, and it was understood that a Special Meeting should be called in the course of two or three weeks to dispose of the matter.

Mr. O. Hehner read a paper "On the Analysis of Five Mineral Waters," and another paper, "Notes on Water Analysis."

Messrs. Piesse, Allen, Jarmain, Heisch, Dr. Dupré, and other gentlemen, took part in the discussion which ensued, and Mr. Hehner replied.

The Secretary read a paper by Mr. Carter Bell, "On Milk Analysis."

The Secretary also read a paper by Mr. Young, "On a New Method for the Estimation of Sulphuric Acid in Vinegar, &c," and a discussion followed, in which Messrs. Hehner, Allen, Heisch and Dr. Dupré joined.

A paper, by Mr. Wynter Blyth, "On Methods of Separating Salicylic Acid," was also read by the Secretary.

An Extraordinary General Meeting of the Society of Public Analysts will be held at Burlington House, Piccadilly, on Friday, December 7th, at five o'clock, to receive the report of the Council, with reference to the resolution of May 3rd, 1876, as to the question of changing the name of the Society, and to pass any resolution thereon. It will be proposed to alter the name of the Society, by omitting the word "Public."

A Special General Meeting will be held at the same time and place, to consider the amended report of the Council, in reference to the replies to be made by the Society to the questions submitted by Dr. Rottenburgh, on behalf of the German Government.

Mr. A. Anthony Nesbitt will be proposed for election as a member.

The Council has recommended the following gentlemen for nomination as Associates, Mr. F. W. Gear, and Mr. W. J. Williams, Assistants to Mr. Wigner.

ON MILK ANALYSIS.

By J. Carter Bell.

Read before the Society of Public Analysts, on 14th November, 1877.

Milk analysis may seem to many a trite subject, but the haziness which exists in the minds and ideas of those to whom we have looked up to as our best authorities, shows that the milk subject is by no means yet exhausted: a painful experience of the manner in which an analysis of milk was interpreted by one who was considered an autocrat in this special branch of Analytical Chemistry led me to undertake a series of investigations.

To make sure that the samples should be genuine I visited all the 17 farms myself, the 183 cows were milked in my presence, and the milk was analysed the same day that the samples were obtained: the samples were gathered under very various conditions, some of the cows had only calved half an hour, while others had not calved for 12, 15, or even 18 months.

The total solids in no case have fallen below 12 per cent. per 100 c.c. of milk, the minimum was 12 and the maximum 33·4, the latter was taken under very exceptional

circumstances, the cow having only calved half an hour before I arrived, it had already been milked once since calving, and my sample was taken from the second milking when there was but very little milk in the udder.

The specific gravity of milk is generally stated to be 1029, but out of the samples which I examined only two or three were found to be so low.

The ash of milk I consider a very important item in its analysis, as far as my experience goes no genuine milk gives a very low ash. Should a milk give an ash lower than ·68 I should look upon it with great suspicion. In the course of these analyses I only found two milks which gave so low an ash as ·68. I thought there might have been some mistake, therefore on the next day I procured a second sample from one of these two cows, and found the ash to be about the same: with regard to the second milk which gave ·68 of ash, the cow had only calved four days, and I believe it had travelled for many miles, which must have had some influence upon the milk, this is the only sample in which the solids not fat fall below nine per cent. When chemists find a milk which yields a very low ash, they should at once examine their platinum dish and they will often find that the lowness of ash is due to the loss of weight which the platinum dish has sustained, it is surprising that so few works upon quantitative analysis notice this loss of weight which platinum dishes are liable to when heated by gas: to show how serious this loss is, and how it may affect an analysis, I will give the weight of my six dishes at different dates.

Feb. 29th, 1876.	May 25th.	October 25th.	Jan 3rd, 1877.	May 1st.	July 19th.
7·284	7·271	7·263	7·264	7·260	7·255
6·144	6·141	6·132	6·131	6·130	6·126
7·065	7·062	7·054	7·050	7·049	7·036
8·627	8·626	8·626	8·618	8·615	8·600
9·583	9·580	9·580	9·573	9·569	9·560
7·600	7·600	7·599	7·585	7·584	7·578

In the course of these milk analyses the dishes have been frequently weighed and the loss of weight noted, to show how seriously this loss would affect the ash of the milks. I will take the ashes of the milks upon the 2nd July and deduct the weight of the platinum dishes as obtained on May 1st, the six ashes would then stand

	·64	·66	·45	·43	·54	·64
they should be						
	·74	·74	·70	·74	·73	·76

The loss of platinum I attribute mainly to the impurities of the gas. I may mention that a large platinum dish used for bread analysis weighed 141·351 grammes, but after about 20 experiments its weight was reduced to 140·663, giving a loss of ·688.

In taking the ash of the milk, care must be exercised not to let the temperature rise too high, for some of the constituents might be volatilized, my plan is to burn at a very low temperature with a piece of platinum foil over the dish until the ash is white, sometimes if the temperature is raised to bright redness, the ash will fuse and encloses particles of carbon which are then very dificult to burn away.

It has been stated that the ash of decomposed milk is lower than the ash of fresh milk; that is not my experience. I have kept milk for weeks and found the ash practically the same as at first.

I analysed a sample of milk twice with the following results:—

	May 11th.	June 18th.
Total Solids	9·00 per cent.	8·19 per cent.
Solids not fat	6.92 „	6·42 „
Fat	2·08 „	1·77 „
Ash	·55 „	·55 „

Another sample gave following results:—

	May 17th.	June 18th.
Total Solids	10·35 per cent.	9·05 per cent.
Solids not fat	7·90 ,,	6·96 ,,
Fat	2·45 ,,	2·08 ,,
Ash	·63 ,,	·64 ,,

From these and other experiments I do not think that the ash of milk ought lightly to be passed over.

In examining this large number of milks it will be seen that I have been careful in obtaining the particulars of the food with which the cows were fed, and though the food does exercise a considerable influence upon the milk, yet I may safely say that no milkdealer could reduce his dairy milk down to the Society's standard without half starving his cows. Ordinary poor feeding does not reduce the quality of the milk so much as some chemists would make us believe, for I have examined the milk of cows which were said to be half starved, and though the milk was decidedly lower in quality than the milk from other cows, yet it did not come nearly so low as the standard given by the Society of Public Analysts.

It seems absurd to think that large cowkeepers should be so blind to their own interests, that they wilfully injure their cows by not giving them food enough to eat, *and it will be seen that out of the* 17 *dairies which I have examined, not one is so low as* 9 *per cent. of solids not fat, and* 2·5 *of fat.* It is true that a man who only keeps one cow may sell milk, and it is just possible that this cow, through bad food or bad health, may give inferior milk, but I do not think that an exceptional case like this should be taken into account in fixing the standard of milk.

In the following tables I have given the name of the farm whence the samples were obtained, the breed, colour and age of the cow, when last calved, the quantity of milk, amount of cream, as shown by the creamometer, specific gravity, total solids, solids not fat, fat, and the ash.

In the following 17 tables, the percentages are given by weight upon 100 cubic centimetre of milk.

No. 1 Dairy—Mr. Green, Kersal Old Hall, 20 cows. The milk was obtained on May 1st to May 4th, 1877. During the time cold east winds prevailed. The cows were all stall-fed; the food consisted of hay, brewer's grains, bean meal, and ground corn. Provender at time of milking.

	Breed.	Colour.	Calved.	Age.	Qts. of Milk.	Cream.	S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
1	Short Horn	Roan	3 days	6	4	15	1036	14·80	11·00	3·80	·92
2	Half Ayrshire	Red & White	4 months	4	3	1	1033	14·00	10·66	3·34	·80
3	Ayrshire	Red	7 ...	8	3	9	1032	14·04	10·14	3·90	·92
4	Short Horn	Roan	4 ...	7	3	9	1029	13·00	9·36	3·64	·88
5	...	White	5 weeks	6	4	10	1030	13·00	9·40	3·60	·81
6	...	Red	2 months	6	4	11	1033	13·32	10·00	3·32	·80
7	...	Light Roan	6 ...	5	4	11	1031	14·82	10·44	4·38	·80
8	...	Dark Roan	8 ...	7	3	16	1032	15·60	11·32	4·28	·77
9	Half Ayrshire	Roan	6 ...	7	3	11	1032	14·06	10·61	3·45	·86
10	Ayrshire	Red	12 ...	3	2	5	1034	14·20	11·00	3·20	·82
11	Short Horn	Roan	3 ...	4	3	3	1031	13·40	10·38	3·02	·77
12	Half Ayrshire	Red & White	8 ...	6	3	7	1033	14·50	10·98	3·52	·80
13	Short Horn	...	6 months	6	4	10	1031	13·70	10·04	3·66	·77
14	...	...	3 days	3	4	13	1035	14·60	10·76	3·84	·84
15	...	...	1 month	4	6	16	1031	14·14	10·16	3·98	·80
16	...	Red	6 months	6	4	13	1032	14·10	10·61	3·49	·81
17	...	Light Roan	7 weeks	6	4	12	1031	14·12	9·87	4·25	·80
18	...	...	12 days	4	4	12	1034	14·32	10·73	3·59	·77
19	...	...	1 month	12	6	9	1032	12·90	9·50	3·40	·86
20	...	...	2 weeks	4	4	2	1033	15·10	10·18	4·92	·84

No. 2 Dairy—Mr. Partington, Kersal Old Hall Farm, 25 cows. May 4th to 9th, 1877. Cold east winds prevailed. Cows stall-fed. Food consisted of hay, brewers' grains, Indian meal and potatoes. Provender after milking.

	Breed.	Colour.	Calved.	Age.	Qts. of Milk.	Cream.	S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
21	Short Horn	Light Roan	1 month	2½	3	5	1032	13·62	9·69	3·93	·80
22	Irish	...	4 ..	4	3	5	1035	15·00	11·42	3·58	·74
23	Short Horn	Red	5 ...	4	3	7	1031	12·90	9·28	3·62	·74
24	...	Red & White	8 ..	5	2	8	1032	14·04	10·26	3·78	·76
25	...	Roan	3 ...	6	4	6	1031	12·50	9·47	3 03	·72
26	...	...	2 ...	7	4	5	1030	12·70	9·70	3·00	·74
27	...	...	2 ...	6	6	8	1030	14·32	9·73	4·59	·76
28	Half Ayrshire	Red & White	12 ...	7	2	...	1030	12·50	9·60	2·90	·82
29	Irish	Dark Roan	6 ...	5	3	...	1030	14·40	9·90	4·50	·76
30	Short Horn	Roan	4 ...	6	3	...	1030	12·04	9·57	2.47	·82
31	...	...	8 ...	8	3	...	1028	12·61	9·21	3·40	·80
32	...	Red & White	6 ...	7	3	...	1032	12·50	9·80	2·70	·84
33	...	Roan	2 ...	4	5	...	1033	14·52	10·47	4·05	·88
34	...	...	3 weeks	4	5	9	1031	12·86	9·50	3·36	·84
35	...	Red & White	3 ...	4	3	6	1031	12·92	9·74	3·18	·80
36	Half Ayrshire	Roan	4 days	4	4	12	1031	14·00	10·46	3·54	·86
37	Short Horn	...	5 months	4	2	9	1032	12·02	9·58	2·44	·88
38	...	Red & White	5 ...	6	4	14	1031	13·62	9·81	3·81	·78
39	...	Light Roan	8 ...	8	2	12	1031	13 32	10·02	3·30	·74
40	...	Dark Red & White	5 days	2½	6	8	1036	13·40	10·10	3·30	·80
41	...	Red & White	4 months	2½	6	6	1033	12·40	9·79	2·61	·80
42	...	...	3 weeks	2½	5	4	1032	12·14	9·58	2·56	·80
43	...	Red	4 months	5	8	9	1032	12·00	9·34	2·66	·72
44	...	...	3 months	5	6	8	1033	12·52	9·45	3·07	·78
45	...	...	14 ...	3	2	7	1033	13·92	10·21	3·71	·76

No. 3 Dairy—Mrs. Marsden, Kersal Farm, 11 cows. May 10th, 11th, 31st, 1877. Stall-fed. Hay, brewers' grains, and bean meal. Cold east winds prevailed. Provender at time of milking.

	Breed.	Colour.	Calved.	Age.	Qts. of Milk.	Cream.	S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
46	Short Horn	Red	5 weeks	2	2	3	1033	13 80	10 50	3·30	·73
47	Friesland	Black & White	4 months	4	6	3	1033	12·42	9·99	2·43	·78
48	Short Horn	Roan	4 ...	7	6	6	1032	13·68	10·20	3·48	·76
49	...	...	3 ...	5	6	10	1033	14·30	10·20	4·10	·78
50	Half Irish	Red and white	17 days	5	6	5	1032	13·84	10 54	3·30	·76
51	Short Horn	Roan	9 weeks	6	6	6	1031	13·16	9.85	3.31	·74
52	Half Ayrshire	Red	8 days	4	4	10	1034	16·60	11·64	4·96	·86
53	Half Scotch	...	5 months	4	5	8	1030	14·28	10·22	4·06	·75
54	Short Horn	Roan	2 ...	5	6	12	1030	14·40	10·80	3.60	·74
55	...	...	17 days	3	4	9	1035	13·04	10·30	2·74	·90
56	Irish	...	17 ...	20 mths	4	8	1033	13·50	10·30	3·20	·78

No. 4 Dairy—Mr. Webster, Sedgley Hall Farm, Prestwich. 20 cows, May 14th, to 17th, 1877. Stall-fed. Hay, grass, brewers' grains, and Indian meal. Out in the fields for 6 hours a day. Provender before milking.

	Breed.	Colour.	Calved.	Age.	Qts. of Milk.	Cream.	S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
57	Short Horn	Roan	7 months	6	3	17	1030	13·80	9·67	4·13	·77
58	...	...	7 ...	5	4	9	1032	12·03	9·43	2·60	·82
59	...	...	4 ...	5	7	11	1031	14·50	10·25	4·25	·76
60	...	Red & White	4 ...	6	3	12	1032	14·36	10·20	4·16	·78
61	...	Roan	6 ...	7	7	6	1033	13·50	10·40	3·20	·83
62	...	...	7 ...	7	3	10	1031	13·40	10·20	3·20	·74

	Breed.	Colour.	Calved.	Age.	Qts. of Milk.	Cream.	S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
63	...	Blue Roan	6 ...	8	7	13	1031	14·22	10·30	3.92	·75
64	...	Roan	4 ...	5	7	7	1032	13·14	10·00	3·14	·75
65	...	...	6 ...	9	4	10	1032	14·00	10·40	3·60	·75
66	...	...	13 ...	7	3	12	1032	12·85	10·13	2·72	·77
67	...	...	5 ...	6	7	7	1033	13·10	10·20	2·90	·75
68	...	...	13 ...	8	4	21	1030	17·04	10·21	6·83	·85
69	...	...	4 ...	6	7	9	1031	13·22	10·10	3·12	·79
70	...	...	7 ...	8	5	8	1034	15·12	11·20	3·92	·83
71	...	...	10 ...	7	4	9	1033	14·00	10 38	3.62	·86
72	...	...	5 ...	6	4	10	1031	12·82	9·60	3·19	·86
73	...	...	13 ...	8	2	...	1030	14·70	10·00	4·70	·75
74	...	...	18 ...	12	3pts.	13	1032	14·10	10·30	3·80	·73
75	...	...	7 ...	2	2	13	1030	13·62	9·62	4·00	·83
76	...	...	5 ...	5	4	17	1032	15·18	10·43	4·75	·80

No. 5 Dairy—Two cows which came from Westmoreland and Yorkshire, May 18th, 1877. Food of No. 1 cow. Hay, oatmeal and bran. No. 2. Hay, corn and grass. Provender at milking.

	Breed.	Colour.	Calved.	Age.	Qts. of Milk.	Cream.	S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
77	Short Horn	Roan	10 days	4	6	7	1032	13·20	9·25	3 95	·75
78	...	Red & White	15 ...	6	7	11	1030	12·80	9·70	3·10	·72

No. 6 Dairy—Mr. Partington, Broughton Farm, Kersal, 19 cows. May 28th to 30th. Cows out in the fields. Provender after milking. Beans meal, Indian meal and grains.

	Breed.	Colour.	Calved.	Age.	Qts. of Milk.	Cream.	S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
79	Short Horn	Roan	12 months.	6	2	...	1036	18·00	12·48	6·52	·86
80	...	Red	2 ...	3	3	9	1033	13·62	10·12	3·50	·68
81	...	Roan	7 ...	4	3	9	1032	14·32	10·35	3·97	·72
82	...	...	7 ...	4	3	9	1030	14·20	9·72	4·48	·74
83	...	Red & White	5 ...	6	3	9	1033	14·12	10 35	3·77	·76
84	...	Roan	4 ...	6	3	13	1032	14·78	10·14	4·64	·78
85	..	Red & White	7 ...	6	2	12	1034	14·54	10·71	3·83	·82
86	...	Roan	2 ...	3	3	5	1032	13·22	9·74	3·48	·71
87	...	...	6 ..	8	4	11	1030	13·32	9·18	4·14	·70
88	...	...	4 ...	3	3	6	1032	13 60	9·85	3·75	·72
89	...	...	3 ...	7	5	9	1033	13·40	10·21	3·19	·74
90	...	Red & White	3 ...	6	3	10	1033	14·00	10·30	3·70	·74
91	Irish	Red	3 ...	7	3	18	1030	13·74	10·14	3·60	·81
92	...	...	12 ...	7	2	13	1031	13·50	10·30	3·20	·72
93	...	Roan	4 ...	7	5	10	1032	13·70	9·84	3·86	·76
94	...	...	4 ...	7	4	11	1034	13·90	10·30	3·60	·78
95	...	...	4 ...	5	5	9	1031	12·50	9·30	3·20	·70
96	Yorkshire	Red & White	7 ...	6	3	12	1032	13·58	10·03	3·55	·74
97	Irish	...	3 ...	6	4	3	1034	13·32	10.05	3·27	·73

No. 7 Dairy—Three cows from Westmoreland, Yorkshire and Lancashire, bought by Mr. Green, and fed by the same food given to his own cows.

	Breed.	Colour.	Calved.	Age.	Qts. of Milk,	Cream.	S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
98	Short Horn.	Roan	4 days	5	6	13	1033	14·58	10·06	4·52	·83
99	...	...	5 ...	9	10	16	1033	16·86	11·00	5·86	·80
100	Half Irish	...	6 ...	7	5	14	1036	15·70	11·56	4·14	·88

No. 8 Dairy, Mr. Finall, Kersal Moor Farm. Five cows, June 8th, 1877. Cows out to grass, provender at milking. Indian meal and brewers' grains.

	Breed.	Colour.	Calved.	Age.	Qts. of Milk.	Cream.	S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
101	Short Horn	Red	4 months	6	5	10	1031	13·70	10·10	3·60	·78
102	...	Roan	4 ...	6	6	6	1032	14·50	10·17	4·33	·73
103	...	...	2 ...	4	6	5	1033	13·00	9·92	3·08	·73
104	...	...	2 ...	4	7	7	1032	13·26	9·61	3·65	·73
105	...	...	1 ...	6	7	7	1032	12·50	9·50	3·00	·78

No. 9 Dairy—Cows from Long Preston, in Yorkshire, June 12th, 1877. Out in the fields. Provender at milking. Bean meal, and brewer's grains. The first two cows had travelled 50 miles by rail and road.

	Breed.	Colour.	Calved.	Age.	Qts. of Milk.	Cream.	S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
106	Short Horn	Roan	1 day	5	5	10	1033	12·33	9·73	2·60	·82
107	..	..	1 day	6	5	14	1638	15·07	11·83	3·24	·90
108	...	...	9 days	6	6	12	1033	13·87	10·16	3·71	·78
109	...	Red & White	4 ...	5	9	12	1029	12·55	8·91	3·64	·68
110	...	White	2 ...	5	6	10	1034	13·70	10·48	3·22	·90

No. 10 Dairy—Mr. Edge, Gordon Street, Lower Broughton, June 19th, 1877. Weather was very hot. Temperature of the Shippon about 80° F. These cows are stall-fed all the year round, and never go out to grass. Food consists of pea meal, mangel wurzel, hay, brewers' grains, and Grimshaw's condiment.

	Breed.	Colour.	Calved.	Age.	Qts. of Milk.	Cream.	S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
111	Short Horn	Roan	3 months	6	9	7	1032	12·44	9·37	3·07	·80
112	...	...	15 ...	6	5	9	1033	13·44	10·00	3·44	·74
113	...	...	6 ...	5	6	4	1034	14·18	10·62	3·56	·76
114	...	...	5 ...	7	9	5	1031	12·46	9·15	3·31	·80
115	...	...	3 ...	4	8	5	1032	12·90	9·45	3·45	·74
116	...	White	6 ...	6	8	...	1033	13·38	9·80	3·58	·74

No. 11 Dairy—Two cows from Yorkshire, two from West Houghton, June 22nd, 1877. Food out in the fields. Provender at milking. Meal and brewers' grains.

	Breed.	Colour.	Calved.	Age.	Qts. of Milk.	Cream.	S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
117	Short Horn	Roan	3 days	6	6	10	1032	14·40	10·00	4·40	·82
118	...	...	not known, been in calf 1 month	6	2	6	1031	13·50	9·20	4·30	·78
119	...	...	1 week	6	5	12	1032	14·60	9·52	5·08	·78
120	...	...	10 months	6	3 pints	...	1032	14·00	9·81	4·19	·76

No. 12 Dairy—Yorkshire cows, July 2nd, 1877. Cows out in the fields. Provender at time of Milking, bean meal, and brewers' grains.

	Breed.	Colour.	Last Calved.	Age.	Qts. of Milk.	Cream.	S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
121	Short Horn	Roan	5 weeks	6	5	11	1031	13·10	9·52	3·58	·74
122	...	...	7 days	6	5	11	1031	15·28	10·06	5·22	·74
123	...	White	10 days	6	6	7	1031	13·64	9 78	3·86	·70
124	...	Red & white	5 days	5	8	...	1032	15·50	10·17	5·33	·74
125	...	Roan	not known	4	4	6	1032	13·60	10·20	3·40	·73
126	...	...	2 weeks	6	7	10	1033	14·44	10·30	4·14	·76

No. 13 Dairy—Eight cows bought by Mr. Green, of Kersal Old Farm. The cows had travelled 50 miles, from North of Lancashire. Out in the fields at grass. Provender at time of milking, bran meal, brewers' grains, July 19th, 1877.

	Breed.	Colour.	Last Calved.	Age.	Qts. of Milk.	Cream.	S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
127	Short Horn	Roan	1 day	5	9	21	1034	16·50	12·27	4·23	·78
128	...	Light Roan	4 days	5	6	9	1035	13·68	10·80	2·88	·90
129	...	Roan	Half-an-hour	6	only 1 pint of milk in udder	48	1054	29·48	20·54	8·94	·94
130	...	...	1 hour	5	1 pint milk...		1075	33·40	31·47	1·93	1·112
131	...	Red	1 day	5	6	7	1042	14·44	13·20	1·24	·78
132	...	Roan	1 ...	4	6	13	1039	15·24	12·80	2·44	·79
133	...	...	4 days	6	5	17	1033	16·14	10·80	5·34	·88
134	...	...	5 ...	6	10	5	1033	15·68	10·54	5·15	·88

No. 14 Dairy—Sixteen cows from a Stockport farm. Out in the fields all day, but taken in at night. Provender at time of milking, bean meal, Indian corn, brewers' grains. The milk from the 16 cows was put into one can, I had it throughly stirred up, and then I took my sample.

Total Solids by weight ...	13·22
Solids not fat ...	9·43
Fat ...	3·79
Ash ...	·70
Specific Gravity...	1032
Cream by volume ...	10

No. 15 Dairy—Two cows. Out in the fields in the day-time. Provender at milking. Brewers' grains, oil cake, bean flour. October 20th, 1877.

	Breed.	Colour.	Calved.	Age.	Qts. of Milk.	Cream.	S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
151	Short Horn	Roan	2 months.	6	4	10	1035	14·00	10·48	3·62	·82
152	...	...	15 ...	5	3	8	1033	13·92	10·37	3·55	·81

No. 16 Dairy—Twenty-five cows. These cows were bought in Yorkshire by Mr. Green of Kersal Old Farm. I saw the cows milked, and I thoroughly mixed the milk in the large can before taking my sample, October 20th, 1877. Out in the fields in the day time. Provender at milking, brewers' grains, bean flour and hay.

Total Solids ...	14·120
Solids not Fat ...	10·460
Fat ...	3·660
Ash ...	·810
Specific Gravity ...	1033
Cream by Volume ...	10

No. 17 Dairy.—John Graham, Rigby Street, Higher Broughton. November 5th, 1877. Eight cows. Short horn out to grass for two hours in the day. Food consists of hay, brewers' grains, bean meal, and bran. Provender while milking. The cows have calved from 5 weeks to 7 months; one cow, the former assured me, had not calved for two years, and was still giving good milk.

By weight.

Total Solids.	Solids not Fat.	Fat.	Ash.
13·7	9·9	3·8	·77

Cream ... 11·5 Specific gravity ... 10·33

The following table gives the number of cows to each dairy, with the composition of the milk by weight. In the previous tables the percentage has been given upon 100 c.c. of milk.

	Cows.	Total Solid Matter.	Solids not Fat.	Fat.	Ash.
1	20	13·6	10·0	3·6	·80
2	25	12·7	9·6	3·1	·77
3	11	13·5	10·1	3·4	·75
4	20	13·5	9·8	3·7	·77
5	2	12·6	9·2	3·4	·71
6	19	13·5	9·8	3·7	·73
7	3	15·2	10·5	4·7	·81
8	5	13·0	9·6	3·4	·73
9	5	13·1	9·9	3·2	·79
10	6	12·7	9·4	3·3	·75
11	4	13·7	9·3	4·4	·76
12	6	14·2	10·0	4·2	·73
13	6	14·8	11·3	3·4	·78
14	16	13·2	9·4	3·8	·70
15	2	13·5	10·1	3·4	·79
16	25	13·7	10·1	3·5	·78
17	8	13·7	9·9	·38	·77
	183				

On examining these tables it will be seen how variable the quantity of cream is as given by the creamometer, in some cases of very rich milks no cream or only a very small quanity was shown by this instrument. This is a very strong proof how utterly untrustworthy is this test. If we take milks numbers 2, 20, 46, 73, 115 and others from the list it is seen that these have not shown much cream by the creamometer, but actual analysis proved that they were first class milks. Therefore to take the volume of the cream, as an indicator whether the milk is good or bad, is so fallacious that this test ought not for one moment to be entertained, because if a milk exhibits a small volume of cream, watering the sample to the extent of 50 per cent. will increase the volume.

There have been some who have acted in the defence of the milkman, and have urged as an excuse for the poorness of the milk sold, that it was due to the milk being sold late in the day, and that the milk on standing had thrown up its cream and the customers who came at the sixth and ninth hours of the day had carried off the cream in the milk supplied to them, whereas the unfortunate ones who came at the eleventh hour could only obtain the impoverished article, because the milkman had omitted to stir up each time he served out a portion. I have put this statement to the test, and the following experiments will show that the customers at the sixth, ninth, and eleventh hours are all practically treated equally. One day in July I bought two gallons of milk. I analysed it and found 100 c.c. to have the composition of

Total Solids	12·30
Fat	2·70
Solids, not Fat	9·60

The milk was put in the cellar, and at every hour from nine o'clock in the morning till twelve o'clock at night, one pint of milk was taken out at the commencement of each hour, and a portion of each pint was analysed. In taking out the pint, great care was taken not to stir the milk; the measure was simply dipped into the milk and taken out. The whole experiment was conducted throughout in the favour of the milkman, and according to these experiments it is more advantageous for customers to be late than early.

	Total Solids.	Fat.
8 o'clock in the morning	12·30	2·70
9	12·68	3·08
10	12·68	3·08
11	12·70	3·10
12	12·70	3·10
1 p.m.	12·24	2·64
2	12·30	2·70
3	12·28	2·68
4	12·88	3·28
5	12·80	3·28
6	12·40	2·80
7	12.54	2·94
8	12·30	2·70
9	12·48	2·88
10	12·88	3.28
11	12·60	3.00
12	12·90	3·30

The Society of Public Analysts has suggested that skim milk shall contain at least nine per cent. of total solids. From my experience this per centage is far too low, and I believe that it is not possible to find skim milk which has been obtained from ordinary genuine

milk that will give so low an amount of total solids as nine per cent. My samples were obtained from the following milks after they had stood from twelve to twenty hours :—

Fresh Milk. Total Solids.	Skim Milk. Total Solids.	Fresh Milk. Total Solids.	Skim Milk. Total Solids.
13·10	9·70	29·48	21·28
15·28	10·48	33·40	31·20
13·64	10·04	14·44	13·84
15·50	10·80	15·24	12·84
13·60	11·00	16·14	11·30
14·44	10·64	15·68	12·08
16·50	12·90	12·90	10·80
13·68	11·68	12·50	9·54
14·12	10·68	14·00	10·81
		13·90	10·80

The analyses of the milk of 183 cows (excluding the two cows numbers 129 and 130, whose milk was in the abnormal state) gives an average of—

Total Solids	13·60
Solids not Fat	9·90
Fat ...	3·70
Ash ...	·76

The foregoing tables, which have been compiled with the most scrupulous care, appear to prove that all pure dairy milk should show at least a specific gravity of 1030 total solids, 12 per cent., and ash ·70; therefore the standard at present fixed by the Society of Public Analysts does not inflict any hardship upon the milk dealers, but on the contrary allows them to water milk to the extent of ten or even twenty per cent.

ON A NEW METHOD FOR THE ESTIMATION OF SULPHURIC ACID IN VINEGAR, &c.

By W. C. Young, F.C.S.

Read before the Society of Public Analysts on 14th November, 1877.

The methods most commonly used for the determination of sulphuric acid in vinegar consist in either estimating the total sulphuric acid as sulphate of barium and deducting from it the amount found as sulphates in the ash, or in taking the acidity of the vinegar after evaporating the acetic acid on a water bath.

The first of these methods is open to the objection that all chlorides present are converted into sulphates, thus taking up part of the sulphuric acid originally present in the free state. In the second method I have found great difficulty in driving off the acetic acid without charring some of the organic matter and consequently forming sulphurous acid; in addition, the objection to the former method applies equally to this, as any hydrochloride acid formed by the action of the sulphuric acid upon the chlorides present would be volatilised.

It occurred to me to take advantage of the decomposition of chlorides by sulphuric acid to estimate the quantity present by determining the amount of hydrochloric acid liberated. This I do in the following manner:—To 30 c.c. of the vinegar under examination is added an excess of chloride of barium and the liquid made up to any convenient bulk; in one-third of the liquid (which is equal to 10 c.c. of the vinegar) is estimated the total chlorine by standard solution of nitrate of silver after carefully

neutralising with weak caustic soda solution; the remaining two-thirds is evaporated to dryness, carefully iminerated, and the chlorine in the ash estimated as before. The difference between the two results calculated for the same quantity of vinegar is due to hydrochloric acid volatilised, from which the sulphuric acid may be deduced by calculation.

I have made many trials of this method and have obtained uniformly exact results, it takes but a short time and indicates only the free sulphuric acid added. It is of course applicable to lime juice or lemon juice.

METHODS OF SEPARATING SALICYLIC ACID.

By A. Wynter Blyth, M.R.C.S.

Read before the Society of Public Analysts on 14th November, 1877.

Salicylic Acid can be separated by (1) dialysis, (2) sublimation, (3) ether acting on an acid solution.

(1) *Dialysis.* Dr. Muter has already described this method, and has also given a process for the colorimetric estimation* of salicylic acid.

(2) *Sublimation.* On placing a little of the pure acid between two watch glasses, and heating for even a few minutes on the water bath at 100°C, the upper glass is clouded by silky crystals, which shows that solutions containing the acid must not be evaporated to dryness at that temperature.

Placed in the subliming cell I have already described† salicylic acid begins to give a scanty sublimite as low as 60.5 C, whilst at 100°C sublimation is rapid.

Sublimation at these low temperatures does not, however, take place in flasks, closed tubes, or the like vessels. I have not succeeded in getting a decided sublimate at 100°C in a closed tube.

Struck, however, with its low subliming temperature I have attempted to distil it over from beer.

A milligramme was dissolved in 100 c.c. of beer, and the beer distilled to dryness, no salicylic acid came over until the residue was apparently dry; then the drops from the delivery tube gave a distinct colouration with ferric chloride, but the whole of it was not obtained.

On using, however, a globular flask without a neck, furnished with a very short wide delivery tube, and the whole immersed almost entirely in a spermaceti bath, and towards the end of the operation passing a stream of purified coal gas through the flask, most of the salicylic acid distilled over at a temperature approaching 149°C.

(3) *Extraction by Ether.* Salicylic acid is very soluble in ether, it does not take the acid up from an aqueous, alkaline solution, but if the solution be strongly acidified by ClH, the removal is complete. A simple experiment will show this; if to a solution of salicylic acid in a test tube ClH is added, then shaken up with ether, and lastly tested with ferric chloride; the lower stratum of liquid will not show a trace of the well-known purplish colour. Advantage of this fact can be taken in the testing of various fluids, such as beer, &c. The beer is first concentrated to a small bulk acidified with ClH and shaken up with ether, the latter removed and evaporated in the usual way.

* Analyst p. 193. 1877. † Analyst, p. 38. 1877.

Milk cannot be manipulated so simply, and merely shaking up with ether, after adding ClH, will scarcely succeed. I find it best to concentrate the milk first at 100°C, and then at 60°C, until it is in a pasty condition. Repeated treatment with ether will now dissolve out both fat and salicylic acid, and after evaporation of the ether the salicylic acid is separated from the fat by obvious methods.

CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

COPPER IN PEAS.

To the Editor of "The Analyst."

Sir,—I have to apologise to Messrs. Paul & Kingzett for having, inadvertently, given them credit for a virtue which they neither seem to possess, nor have apparently, any desire to possess, viz.: that of retracting a statment when it has been shown to be based on insufficient data.

I need scarcely say, however, that the passage in my letter, in the last number of The Analyst, relating to the above subject was not written with a view to converting Messrs. Paul & Kingzett to correct views on this subject, for their personal opinion on such questions is a matter of perfect indifference. The passage was written in order to save Public Analysts—who might think that where there is so much cry, there must be at least a little wool—from being misled by statements and conclusions which are utterly worthless, being based on a few crude, very crude experiments conducted by men destitute of the knowledge necessary for such inquiries.

I remain, yours, &c.,

Westminster Hospital, A. DUPRÉ.
Nov. 24th, 1877.

LAW REPORTS.

(BEFORE Mr. JUSTICE FRY.)

THE ATTORNEY-GENERAL *v.* THE GAS LIGHT AND COKE COMPANY.

This was an information at the relation of the West Ham Local Board to restrain the Gas Light and Coke Company from carrying on business at their works at Canning Town so as to cause a public nuisance. The nuisance complained of arose from the discharge of sulphuretted hydrogen from gas lime during the process of moving it. The defendants did not deny the nuisance, but they raised a defence which amounted to a claim to a statutory power to commit the nuisance. They alleged that under their own Acts and the various Metropolitan Gas Acts, and the requisitions of the referees appointed under those Acts, they are bound to produce gas of a certain degree of purity with reference to sulphur compounds; that they are bound to eliminate from the gas they supply to the metropolis sulphur compounds to such an extent as to render it practically impossible for them to carry on their works without discharging the noxious gas complained of. The hearing of the action has occupied nearly three days; many witnesses (chiefly scientific) have been examined; and the tiny, dark court has been crammed; consequently, notwithstanding the utmost endeavours to procure proper ventilation, the sanitary conditions of the court have been most unfavourable. Fortunately it was a case in which it was not necessary to exclude the witnesses (not actually under examination) and turn them out in the rain.

Mr. Kay, Q.C., Mr. Aston, Q.C., Mr. Bardswell, and Mr. R. E. Webster appeared for the plaintiffs; Mr. Benjamin, Q.C., Mr. Davey, Q.C., Mr. A. L. Smith, and Mr. Hornell for the defendants.

Mr. Justice Fry said that the evidence established that for a great part of the period during which the nuisance was complained of a large part of the noxious vapour was due to the shovelling and disturbance of gas-lime which the defendants had taken to their Bromley works from their two other gasworks. Dr. Odling, one of the defendant's own witnesses, estimated the proportion at one-half; the defendants would have no statutory justification for this proceeding, and the plaintiff would be entitled to an injunction on this ground. His Lordship, in construing the various Acts of Parliament which had been referred to gave his opinion that the liability of the company in respect of nuisance was expressly kept on foot. But, apart from that consideration, he thought the defendants had not shown that they had adopted all the means in their power to prevent the nuisance. The referees, officers appointed under the Gas Acts, had in the discharge of their duties fixed a standard of purity, such that, in their opinion, the gas companies, in the present state of gas engineering, could practically attain without the necessity of injuring any one; and therefore there rested on the defendants the burden of showing that they had adopted the best means of preventing the nuisance. In his opinion they had failed to discharge that burden, and an injunction

must be granted, not merely limited to the foreign lime from other works. A period of three months' grace was allowed to enable the Gas Company to devise better means of taking their used-up lime from the purifiers and to remove it.—*Times*.

Heavy Penalty for Impurity in Gas.—At Worship Street, the Commercial Gas Company, of Stepney, appeared to an adjourned summons requiring them to show cause why a warrant of distress should not be issued to recover the sum of £400, being eight penalties of £50 each, for having on eight days supplied gas of a less purity than allowed by the Act of the Company. Mr. Besley, instructed by Mr. Spencer, appeared on behalf of the Board of Works to support the summonses; Mr. Reed appeared for the Company. Mr. Besley said that he appeared to ask the magistrate to issue a warrant of distress against the Company for the recovery of eight penalties of £50 each, for which they were liable under the Act of Parliament 38 and 39 Vic., cap. 200 (the private Act of the Company). In this case the defendant Company had on the 15th, 17th, 18th, 19th, 20th, 21st, 22nd, and 24th days of September last, supplied gas of less purity than allowed by the Act of Parliament. The quality of the gas supplied was determined by officers called gas referees, who from time to time fixed the *maximum* of impurity at which gas was to be supplied. In this case the impurity complained of was an excess of ammonia over that which the referees had fixed as the *maximum*. The fact was known to the defendant Company from the report of the examiner. They had not appealed to the chief gas examiner, and the penalties were, therefore, recoverable against them by distress warrant. Mr. Besley also pointed out that the Act gave the magistrate no power to mitigate the penalities, and added that the question had arisen whether the issuing the warrant of distress was not really an *ex parte* proceeding in which the Company were not entitled to be heard. A clerk from the office of the Metropolitan Board of Works then proved that Mr. Edwin Adenbrook was the appointed gas examiner at the Parnell road testing-house of the Commercial Gas Company. Mr. Adenbrook proved testing the gas supplied through the testing-house from the works of the defendant Company, and produced his certificates of such testing. Mr. Charles Fry, principal assistant in the Solicitor's Department of the Metropolitan Board of Works, produced the certificate of the gas referees appointing the quality of the gas to be supplied. From this it appeared that the *maximum* of ammonia allowed was 20·5 grains per 100 cubic feet. Mr. Hannay examined the certificates of the gas examiner, and said there were some four, some five, and some three in excess. Mr. Reed cross-examined the witness Adenbrook, who said that the testing extended over 20 hours, as required by the Act. He had supplied a copy of the certificates to the Secretary of the Company, and by courtesy, one to the Engineer. In the latter he had marked the excess of ammonia by underlining the figures, and he considered that sufficient notice. For the defence, Mr. Reed said he should have to make an objection to the jurisdiction of the court, the Company's Works being out of the jurisdiction. Mr. Hannay overruled the objection, Mr. Besley pointing out that the testing station where the offences were shown was within the district of the court. Mr. Reed took a further objection, that the notice given to the Company was insufficient under the Act, but this was also overruled. Mr. Hannay said that upon the facts proved, he could only order the warrant to issue for the penalties claimed, £400.—*Times*.

Attempting to Bribe an Analyst.—Benjamin Kirkham, dairyman, 26, Charlotte Street, Blackfriars Road, was summoned before Mr. Partridge by the sanitary inspector of St. Saviour's Board of Works, for selling milk adulterated to the extent of 12 per cent. of water. Mr. Simpson, Vestry Clerk, prosecuted. Mr. Errington proved the purchase of the milk on Monday the 5th, and taking a sample to Dr. Bernays, of St. Thomas' Hospital, for analysis. Dr. Bernays said that soon after the sample was left with him in a sealed bottle by last witness, defendant came into the laboratory and said it was not a fair sample of his milk, and, thrusting a half-sovereign into his hand, asked him to make a favourable analysis. Witness threw the coin away and told him he should analyse it in the usual way. Witness afterwards analysed it and found it to be adulterated with 12 per cent of water. The defendant said he was ill at the time and left the charge of the milk to his man. As for the half-sovereign he tendered it to Dr. Bernays for the trouble he had put him to on previous occasions. Mr. Errington was recalled, and, in answer to Mr. Simpson, said that the defendant was fined £5 in 1875. Mr. Partridge fined the defendant £10 and costs. Charles Hill, 9, Little Charlotte Street, and Thomas Bevan, Nelson Square, dairymen, were each fined 40s. and costs for a similar offence.—*Times*.

Adulterated Honey.—At the Central Police Court before Mr. Gemmel, Stipendiary. Malcolm Campbell, grocer, 89, George Street, was charged under the Adulteration Act 1875, section 6, with having, on the 22nd August, sold to Alexander Johnston Walker, Food Inspector of the Sanitary Department, three jars of honey, which were not of the nature, substance, and quality demanded. Campbell pleaded not guilty, and evidence was led, Mr. Walker stating that on the day in question he saw in the window of defendant's shop a ticket setting forth that pure comb honey was sold in jars. He entered the shop and bought three of the jars paying 9½d. each for them. Campbell was then told that they would be analysed, and Walker offered to leave a portion of it with him. Campbell declined to receive it, and Walker sealed up the sample, which was sent to Dr. Clarke for analysis. Dr. Clarke stated that he had analysed the sample, and found it contained 57 per cent. of glucose, a preparation from starch. Campbell said in

defence that the honey was sent to him warranted to be genuine American honey, and he believed it to be so. The Stipendiary, however, found the charge proven, and imposed a penalty of £2 with the alternative of 7 days' imprisonment.—*Glasgow Evening Citizen.*

HEAVY PENALTY FOR MILK ADULTERATION.—John Adams, farmer and milk contractor, Southall, who supplied milk to the St. Marylebone parochial schools, was summoned before the Brentford magistrates, for selling adulterated milk. Of two samples of milk obtained from the defendant's cart, one was certified by Dr. Redwood to contain 19 per cent. of added water, and the other 16 per cent. Mr. John Paton, superintendent of the schools, stated that the defendant had held the contract for the milk supply for four or five years. The consumption amounted to about 160 gallons per week, and the defendant's account reached the large sum of £900, or £1,000 per year. By the terms of his contract he was bound to supply "good, genuine, unadulterated, new milk from the cow," and the witness had written to him two or three times calling his attention to the quality. The chairman (Mr. Glossop) said the case was a bad one, because the milk was intended for children, many of whom were weakly and scrofulous, and to whom a good milk diet was essential. Therefore this adulteration was very wicked, and the magistrates had decided to impose a fine of £20, and £2, costs.

ADULTERATION OF GIN.—At Lanchester Petty Sessions, Joseph Towns, innkeeper, was summoned for selling adulterated gin The magistrates were Mr. Fawcett (chairman), Mr. E. T. Smith, Mr. Clavering, and the Rev. J. P. De Pledge. Superintendent Oliver, the inspector, said, on the 18th August, he called at Mr. Town's house and obtained a pint of gin, which he divided into three parts, one he sent to Mr. Edgar, the county analyst, whose certificate he now produced, showing that the gin was 30 per cent. under proof. Mr. Granger of Durham, who appeared for the defence, said he did not dispute that the gin was 30 per cent. under proof. The question for the magistrates to decide was whether this was an adulteration within the meaning of the Act. Mr. Town, the defendant was called, and said the gin which he sold was not reduced in strength. He got it from Mr. Greenwell, and received an excise permit with it. Mr. Greenwell, on being called, said he had been in the wine trade 36 years, and during the whole of that time he had been in the habit of selling gin at 30 per cent. under proof, which he considered a very good strength. Mr. De Pledge: What is gin generally made at? Mr. Greenwell: From 17 to 22 under proof. We never buy any stronger than 22. He considered that gin 22 under proof was better than 17 under proof. Mr. Hearn, Supervisor of Excise, Durham, said he had been connected with the trade upwards of 20 years, having been in it at Liverpool, Dublin and London. He considered 30 per cent. under proof was a fair saleable article. The Chairman: Suppose you asked for a glass of gin what strength would you expect to get it?—Mr. Hearn said he should not expect to get it any lower than 30. The Chairman: You consider 30 per cent. under proof is a good commercial article? Mr. Wilson: Yes. The magistrates then retired. On their return, Mr. Clavering said they had decided to convict. Defendant was fined 10s. and costs. The Chairman said: Because the decision has not come from the chair, it will naturally be supposed that I disagree with the other magistrates. I am sorry to disagree with my brother magistrates at any time, but I do not agree with them in the present judgment.

Mr. Plimsoll, M P., was present at a temperance meeting at Derby last month, and in the course of his remarks said,—"I have long held the opinion that a great deal of the crime which is attributed to intoxication in this country is not so much owing to the quantity of drink which the criminal has consumed as to the abominable adulteration by which the drink has been treated before it was sold to him. There are certain classes of people in London, I am informed—certain classes of tradesmen who are called publicans' chemists, who sell articles by which the spirits which they receive from the distilleries are adulterated, to the great injury of the people who consume them, and it is impossible to see the almost total absence of intoxication which you may see on the Continent, where every one drinks the light wines of the country, without being convinced that the people are intoxicated—which means poisoned, as distinct from inebriated which means drunk—that they are here intoxicated or poisoned by the drink they get at some of the public houses in the country. As to spirits I know very little, but I do happen to know that salt is used very strongly by common brewers in the country with the distinct purpose—I speak deliberately because I speak of things I know—with the distinct object of making the people who drink the beer thirsty. I have known a case in which a large load of salt, some 70 or 80 tons, was taken to a large brewery in one town in the Midland Counties, and if that is the case it is a frightful fraud and a wicked sin; and if a person drinks a pint or half a pint of ale in a reasonable manner, to satisfy thirst, and he or she finds him or herself a short time afterwards as thirsty as before, if they are unwilling to take water, as we know they are, they must drink again or bear the thirst. I think it is a wicked thing which it is impossible should be allowed. I felt this so strongly that when the Act of 1872 was before the House of Commons I obtained a schedule of the things prohibited to be used in the manufacture of liquor, and it may be instructive to this meeting to know what Parliament did prohibit in that schedule. In Committee, I strove, and strove hard, to have the use of salt in breweries prohibited along with the use of other things, but I was resisted very stoutly indeed by some members of Parliament who were interested in brewing, not by my colleague, and they

declared over and over again that it was not used, and the divisions that were taken were carried against me. But in the course of the debate they had contended that it was not used, and when the Bill came up for third reading I put it that if they did not use it, the prohibition of its use could do them no harm, and I moved for the recommittal of the Bill, and had this matter put in as a prohibited article. A very short time after that, however, a deputation of brewers waited on the Home Secretary, who had power to vary the schedule, and though it was stated in the House of Commons over and over again that salt was not used, their appeal to the Home Secretary was, that beer would not keep without salt was used, and they succeeded in obtaining sanction for its use in limited quantities. I always like to speak from the book, and so I went to the House of Commons' library to see if I could find the Order of Council authorizing this, but the library was cold and I was warm, and I could not stay long enough to find out whether it was authorized or not, so I cannot say; but in the 37th and 38th Victoria, cap. 49, sec. 33, passed two years afterwards, the whole of the four clauses on the Bill of 1872 making adulteration criminal, and providing for the punishment of those who had adulterated, and the schedule of things prohibited were all repealed by the Government which is now in power. It will give you an idea of some of the things that are used if I read to you the schedule of the things prohibited, and which we may, therefore, assume were used, for I don't suppose Parliament, or the Government, would prohibit these things unless they had good reason for knowing they were used. In the 35th and 36th Victoria the following things are mentioned:—'Cocculus indicus, darnel seed, chloride of sodium' which is, of course, common salt—'copperas, opium, strychnine, tobacco, extract of logwood, sulphate of zinc or lead, and alum, or any extract or compound of the above ingredients,' these were the things prohibited. If any one is fond of his glass and thinks it does him good, I would have him bear that list in mind. I think the temperance societies might possibly—I submit the suggestion with much deference—do some good if they were to try to obtain an authoritative exposition of some of those things, and if they cannot secure the punishment of those who use them they may at least secure their exposure."—*Times*.

NOTES OF THE MONTH.

Milkmen appear to think that analysts belong to the same category as detectives, and that for a consideration they may be induced to depart from the strict line which their duty lays out for them. We do not suppose that Dr. Bernays went quite so far as the paragraph in the *Times*, states as to throw away the coin with which Mr. Kirkham presented him, but it is clear that notwithstanding the tender of half a sovereign, which of course he indignantly refused, Dr. Bernays found that Mr. Kirkham's milk was adulterated, and in consequence Mr. Partridge fined the latter person £10 and costs. It is perhaps rather significant, and may serve as a warning to other peccant milkmen, if we point out that two more of the fraternity were summoned at the same time for a similar offence, but not having attempted to bribe the analyst, were only fined 40s. each. On the whole it must have been rather an expensive morning's work for Mr. Kirkham, and we can only hope that he was satisfied with it.

The analysts at Somerset House seem to have an irresistible tendency to over-estimate everything. They have already succeeded in finding ·78 per cent. of ash in milk where several other analysts could only find ·72; they have also in several cases found more milk in a mixture of milk and water than any experienced analyst pitted against them could find, and now they have capped their work by finding 13 grains of alum per 4-lb. loaf where three public analysts, who presumably had had ten-fold their experience, had only succeeded in finding 10 grains. Really it looks as if they lived in such a cloud of smoke at Somerset House that the ashes must drop into their crucibles and make the results heavier.

Gin cases are going on all over the country, and convictions are most frequently obtained; and the publicans, we are glad to see, are adopting the common sense mode of labelling their bottles as a mixture of dilute spirit, but this, although a step in the

right direction is not sufficient; they must not only say it is diluted but what the degree of dilution is. There can be no possible reason why a publican should get off free whilst a milkman is fined for a similar offence.

Mr. Plimsoll, M.P., appears to have taken a fancy to teetotal meetings, and has been reviving the fallacies which Lord Truro published in the *Times* a few weeks since, that the injurious effect of stimulants is caused mainly by the adulterants which are added to them. It is a great pity that a man who has done a really good work in a special line which he has laid out for himself should trespass upon matters about which he knows nothing, and should therefore make such mistakes as are contained in his recent speech at Derby. As to salt in beer our readers will remember what we said last month about it, and some will probably be prepared for the sequel. The beer from a number of public-houses in one of the London districts, which for the last three years has averaged less than 15 grains of salt per gallon, has since the recent certificate of Messrs. Bell, Bannister & Co., suddenly increased to from 65 to 75 grains per gallon. We are quite sure our readers will view with satisfaction the statement that one of these adulterators was summoned and fined, but did not think it worth while to appeal to Somerset House, because when his wife was put into the witness-box she acknowledged having thrown a handful of salt into the barrel of beer. This case is an illustration of the necessity for the amendment of the Act of Parliament to the extent of making the publication of the convictions compulsory. At present the payment of a fee is sometimes, as in this case, sufficient to prevent such a misdemeanour from becoming known to the public unless we publish it. It is clear that some change in the law is necessary.

It is pleasant to note that the German Government are following in the wake of our own, and are about to introduce into their Parliament a Bill for preventing the adulteration of food and drugs, and also that they recognise the services which our Society has already rendered in the matter by sending their Commissioner to us first for information. The facts elicited in the discussions which have already taken place will help greatly towards the adoption of the amendments suggested by our Society in the present Act and which will be introduced in the Bill to be brought forward next session, and not the least important of these is the confiscation and destruction in certain cases of adulterated articles.

We have received several letters with reference to the question of salt in beer, but have not space to refer to the matterfully this month. We were not aware that the schedule of the Licensing Act was still in force, but from the following quotation it *appears* it is.

The chemical waters are again troubled by analytical disturbances, and several journals have rather gone out of their way to describe the matter in question as "analytical discrepancies." This is scarcely a fair designation, as will be seen from the facts, which may be thus briefly set forth. Mr. Gatehouse found in a sample of Burton beer 68 grains of common salt to the gallon, while the report from the laboratory at Somerset House shows the presence of 66·5 grains to the gallon, but goes on to say that "the strong Burton beers contain about 60 grains of common salt per gallon, solely derived from the water, malt, and hops used." Now, as regards the analysis the discrepancy is not very dreadful, but objection may and has been taken against the additional statement which is quoted above. It is not probable that the water, malt, and hops would furnish so much salt, and this has been placed beyond doubt by subsequent work conducted by Mr. Gatehouse. The Licensing Act allows the presence of 50 grains of common salt to the gallon of beer, to cover the quantities introduced into beer from the sources stated; hence anything above that amount is fairly viewed as evidence of adulteration. The squabble to which allusion has been made would have been avoided had the Somerset House analysts restricted themselves to the bare analysis. It was an act of supererogation to make the additional statement which caused the grievance. If analytical and

consulting chemists generally in giving certificates confined themselves more particularly to the facts of their investigations, and abstained from going into hypothetical reasons and expressing opinions of qualities and things, and instituting comparisons, such certificates would be less offensive to a healthy professional mind, and admit less of malconstruction or abuse.—*Pharmaceutical Journal.*

THE DILUTION OF GIN.—At a meeting of licensed victuallers and wine and spirit merchants, held yesterday at York, to consider the recent decisions in reference to the adulteration of gin with water, a letter was read from the Chancellor of the Exchequer, stating that it was impossible for him to say just yet what could be done with regard to the subject. The question of the reduction of the strength of gin by water was not a revenue matter. The Local Government Board were now, he believed, consulting the Inland Revenue Department, and the whole subject would be fully discussed, with a view to determine whether any legislation was practicable or desirable.—*Evening Standard.*

The prize offered by the Leipzig Pharmaceutical Association for a trustworthy method of butter analysis, has been awarded to Otto Hehner, F.C.S., Public Analyst for the Isle of Wight, and Arthur Angell, F.R.M.S., Public Analyst for the county of Hants. As one of the stipulations, namely, that the successful essay should become the exclusive property of the Association could not be fulfilled by Messrs. Hehner & Angell, their method having been published some years ago, and as the examiners, Professors Heintz, Knop & Kohlmann, yet wished to show their appreciation of the method, they presented the Authors with the sum of 150 marks.

Mr. Wm. Fredk. Donkin, F.C.S., has been appointed Public Analyst for the Borough of Abingdon.

Mr. J. A. Woodhams, has been appointed Public Analyst for Rye, Sussex, in the place of Mr. W. A. Smith resigned.

RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
1171	J. Coquillion	Carburometer for Analyzing Carburets, &c.	6d.
1185	F. A. Bonnefin	Extracting and Treating Juice from Sugar Canes, &c.	6d.
1219	J. H. Bald	Utilizing Residual and other Oxides of Iron	2d.
1300	J. C. Martin	Manufacture of White Lead	6d.
1309	H. A. Bonneville	Hydraulic Press for separating Liquids from Solid Matters	6d.
1327	P. A. E. Brémond	Medicated Bath Apparatus	2d.
1358	D. Whitehouse	Pickling Sheet Iron for Manufacture of Tin and Terne Plate	8d.
1392	T. J. Smith	Liquid Sulphate of Alumina	2d.
1396	G. H. Fish	Apparatus for Compressing Air	6d.
1402	R. S. Best and R. Morris	Sulphates of Sodium and Potassium	2d.
1405	J. Jackson and T. R. Mellar ...	Evaporating Liquids	6d.
1414	J. Eckart	Preserving Food	6d.
1462	J. Livesey	Filters for Water and Air	6d.
1465	J. Holloway	Production of Metallic Silicides	4d.
1536	H. B. Condy	Manufacture of Soda	4d.
1556	W. L. Wise...	Preparing Caustic Alkalies and Preparations... ...	4d.
1563	E. L. Mayer	Separating Silver from Cupreous Solutions	4d.
1618	F. W. Kalbfleisch	Concentrating Sulphuric Acid	6d.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Medical Record; The Miller; The Anti-Adulteration Review; Journal of Applied Science; The Country Brewers' Gazette; Brewing Practically and Scientifically Considered, by E. R. Southby, *M.R.C.S.; Preventive* Medicine in Relation to Public Health, by Alfred Carpenter, M.D.

The Analyst,

INCLUDING THE PROCEEDINGS OF

THE "SOCIETY OF PUBLIC ANALYSTS."

A MONTHLY JOURNAL FOR THE INFORMATION OF THOSE INTERESTED IN THE PURITY OF FOOD AND DRUGS, AND IN GENERAL ANALYTICAL AND MICROSCOPICAL RESEARCH.

EDITED BY

G. W. WIGNER, F.C.S.,

ONE OF THE

Hon. Secretaries of the Society of Public Analysts;

AND

J. MUTER, Ph.D., F.C.S.,

ONE OF THE

Vice-Presidents of the Society of Public Analysts.

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1878.

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THE ANALYST.

THE GERMAN GOVERNMENT AND ADULTERATION.

THE Questions submitted to the Society of Public Analysts by Dr. Rottenburgh, on behalf of the German Government, together with the Answers of the Society, cannot fail to interest our readers. They show that the steps taken by our legislature, in passing the Adulteration Acts of 1860 and 1872, and the Sale of Food and Drugs' Act of 1875, have proved so far satisfactory in practice that the most powerful of the continental nations intends to follow our leading. Having come to this decision it is also satisfactory that the German Government should apply to our Society as the best exponent of the results obtained by the working of the Acts. We do not wish to imply by this that we alone have advised the Imperial Government on the matter, for we know that the Local Government Board have also given some information, and we also advised the Commissioner to apply to the Trades Protection Societies, in order that he might judge for himself how slender is the foundation on which their much-talked of grievances rest. On this point we can hardly do better than refer our readers to an extract we reprint from a recent leading article in the *Grocer*. This trade journal has ever been one of the foremost in denouncing analysts and analytical work, and has over and over again spoken of the Adulteration Acts as if they were used simply to harass honest tradesmen. Now, however, its tone is changed; it appears at last to have been educated up to the standard of purity, and directly its education is complete it finds, as we found long ago, that adulteration is rampant. Nothing that we have ever written or published in these pages has been such a scathing condemnation of tradesmen as adulterators as the first paragraph from the *Grocer's* leading article. We sincerely hope that having got thus far on the road to common sense we may cease to see the *Grocer* using such childish phrases as "incompetent analysts," and that it will boldly co-operate with us in the attempt to suppress adulteration. By doing this all honest traders (and we believe they are the majority) will be benefitted, and dishonest ones will be "stamped out." This is a consummation sincerely to be hoped for.

Leaving this part of the subject, we consider next the replies to the questions of Dr. Rottenburgh. Of course many of these replies are of comparatively minor importance, but there are others which show that the German Commissioner has really put his hand upon some of the defects which still exist in our Act, and has in many cases pointed out as well as we could have done the parts which need amendment. This of course is satisfactory, because the report which he will make to his Government will unquestionably have some weight with our legislature next session in the discussion of the alterations to be made in our own law.

The replies to Questions 1, 2 and 3 are of great importance; they embody the principle for which our Society has all along contended, viz., that analysts should have certain definite limits laid down, according to which it should be their duty to work, and from which there should be no appeal. The present state of things in this country is eminently unsatisfactory. The Society, after long deliberations, adopted a limit in the case of milk which allowed the milk of an ordinary healthy cow to be diluted with five per cent. of water and yet pass without condemnation; this in itself was a doubtful proceed-

ing, but the employés at Somerset House have apparently capped it by taking, as a standard, the poorest possible milk that ever man extracted from a cow under any circumstances, and they have seemingly finally decided that as far as they are concerned average milk with 20 per cent. of added water should be passed as genuine, lest by chance the proprietor of a diseased or underfed cow should accidentally suffer, say once in 20 years. Such a conclusion is, we hold, as lamentable as it is ridiculous, and against all preconceived notions of public morality. We hope that the German Government will not allow this sort of thing to happen, and we believe our own will set it right in the Bill to be brought forward next session.

The answer to Question No. 10 is also of much importance, and is another of the points which will form a basis of legislation. Nearly all the publicans in London are now labelling their bottles, "This is diluted spirit," and under the protection afforded by this evasive label they are selling gin and water. Such an abortive result was certainly never contemplated by the Select Committee of 1874.

The Questions Nos. 23 and 27 are also important, and in these cases again the replies embody the opinions which have been previously expressed by our Society. The German Commissioner—who had himself been put in communication with the Somerset House authorities—has detected the flaw in the theoretically good idea of making them act as a Court of Appeal, and virtually suggests the reply. It does not need any words of ours to show that as during one year they had only five samples to analyse under the Act, that hasty generalisations are all that could be expected. Five minutes of cross-examination is generally enough to dispose of such witnesses.

SOCIETY OF PUBLIC ANALYSTS.

An Extraordinary General Meeting was held at Burlington House, Piccadilly, on the 7th December, the President, Dr. Dupré, F.R.S., in the Chair.

The Minutes of the previous Meeting were read and confirmed.

Mr. A. Anthony Nesbitt was proposed for election as a member, and Mr. F. W. Gear and Mr. W. J. Williams (assistants to Mr. Wigner), as associates.

The Ballot will be taken at the next Meeting.

Mr. Wigner proposed, and Mr. Heisch seconded a resolution "That the name of the Society be changed, by omitting the word 'Public.'"

The proposal was discussed at great length, and ultimately a division was taken, when it appeared there was a tie, on which Mr. Wigner withdrew the proposal.

The Meeting was then made Special, for the purpose of considering the amended Report of the Council in reference to the replies to be made by the Society to the questions submitted by Dr. Rottenburgh on behalf of the German Government. The replies suggested were considered *seriatim*, and after some alterations had been made in them it was proposed and unanimously resolved that they should be forwarded, as amended, to Dr. Rottenburgh, as the replies of the Society to his questions.

Mr. Angell exhibited to the Meeting two pieces of apparatus made by Cetti & Co., one a colorimeter for comparing the colours of waters, and one for the estimation of fat in food stuffs, by washing with ether vapour. The former consists of two long, clear glass tubes, each furnished with a mirror at the bottom; the tubes when full are closed

lightly with small pieces of clear glass, by which means all refraction is destroyed, and clear discs of light are produced, by this means a column of three feet in length can be examined for colour and turbidity.

The ether extraction apparatus consists of a glass capped funnel, furnished below with a stoppered flask; the substance, enclosed in a filter paper, is placed into the funnel, and ether in the flask, the whole is then attached to an upright condenser, and the ether is boiled for two hours, when all fat will be extracted. Mr. Angell did not claim anything new in the principles involved in these processes, but thought that he had improved the necessary appliances.

The next Meeting of the Society of Public Analysts will be held on Wednesday, the 16th inst., at Burlington House, Piccadilly, at 8 o'clock.

REPLIES TO THE INQUIRIES BY THE GERMAN GOVERNMENT AS TO THE WORKING OF THE SALE OF FOOD AND DRUGS' ACT.

The following are the Questions submitted to the Society of Public Analysts by Dr. Rottenburgh, the Representative of the German Government, and the Answers as agreed to at the Special General Meeting of the Society on 7th December last.

1. Is the definition of offences in the Sale of Food and Drugs Act a satisfactory one?

   Certainly not; the definition of our Society should be adopted. See "Proceedings of the Society of Public Analysts," page 2,* (a copy of which has been sent to Dr. Rottenburgh.)

2. Is it desirable to define adulteration in relation to a fixed standard of composition for each article of food, or should the definition be a general one?

   The definition should be general except as regards the articles mentioned in the "limits," see "Proceedings" referred to above, page 2.* Power should be given to

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* *Extracts from* "Proceedings of the Society of Public Analysts," vol. i. p. 2.

Definition of an Adulterated Article.—An article shall be deemed to be adulterated—

(a.) In the case of food or drink.

1. If it contain any ingredient which may render such article injurious to the health of a consumer.
2. If it contain any substance that sensibly increases its weight, bulk, or strength, or gives it a fictitious value, unless the amount of such substance present be due to circumstances necessarily appertaining to its collection or manufacture, or be necessary for its preservation, or unless the presence thereof be acknowledged at the time of sale.
3. If any important constituent has deen wholly or in part abstracted or omitted, unless acknowledgment of such abstraction or omission be made at the time of sale.
4. If it be an imitation of, or be sold under the name of another article.

(b.) In the case of drugs.

1. If when retailed for medicinal purposes, under a name recognised in the *British Pharmacopœia*, it be not equal in strength and purity to the standard laid down in that work.
2. If when sold under a name not recognised in the *British Pharmacopœia* it differ materially from the standard laid down in approved works on "Materia Medica," or the professed standard under which it is sold.

Limits.—The following shall be deemed limits for the respective articles referred to:—

Milk shall contain not less than 9 per cent. by weight of milk solids not fat, and not less than 2·5 per cent. of butter fat.

Skim milk shall contain not less than 9 per cent. by weight of milk solids not fat.

Butter shall contain not less than 80·0 per cent. of butter fat.

Tea shall not contain more than 8 per cent. of mineral matters, calculated on the tea dried at 100C, of which at least 3·0 per cent. shall be soluble in water, and the tea as sold shall yield at least 30 per cent. of extract.

Cocoa shall contain at least 20 per cent. of cocoa fat.

Vinegar shall contain not less than 3 per cent. of acetic acid.

the Home Secretary or some other similar officer as the Central Authority acting on the advice of the Body of Referees to make such additions to those limits as from time to time might be desirable.

3. Would it be advisable to have several authorities, with power to fix the standards, or would it be better to have only one Central Authority with that power?

The definition of standards and limits should be embodied in a schedule to the Act passed by the Imperial Parliament, subject to revision as before mentioned by the Home Secretary or some other similar officer, on the advice of the Body of Referees.

4. Suppose an Analyst fixed a certain minimum of standard, *e.g.*, in the case of milk, would not all dealers in milk dilute it down to that standard?

Most probably, but no Analyst should have power to fix such a standard without the consent of the Body of Referees.

5. Has the punishment of imprisonment often been employed, or has the fine been sufficient?

As far as we are aware imprisonment has only been inflicted in a few cases; fines, if heavy enough, have generally been sufficient, but in many cases the fines are not heavy enough.

6. Would it be advisable to publish the punishments inflicted?

Yes, at the discretion of the Court.

7. Would it be advisable, besides either money-fine or imprisonment, to authorise the confiscation of the stock which has been found to be adulterated?

Yes, when possible after conviction, at the discretion of the Court.

8. Ought the retail dealer to be compelled to give the name of the wholesale dealer of whom he purchased the adulterated article?

Yes.

9. In a case of adulteration found to be *injurious to health*, would it be advisable to provisionally seize the article as soon as the Analyst has given his certificate?

Yes, decidedly.

10. Would it be advisable to state on the label of a mixed article the percentage of that mixture?

Yes, the label should state the maximum percentage of foreign ingredients contained in the mixture.

11. Would it be advisable to make the appointment of an Analyst in every district compulsory?

Certainly.

12. Is it advisable to leave the appointment of an Analyst to the local authority?

Yes, subject to confirmation by the Central Authority.

13. Have the selected Analysts often been rejected by the Local Government Board?

Very rarely.

14. In what manner should Analysts be paid?

By yearly salary for a fixed number of samples; an increased payment to be made if more than that number of samples are analysed, at a fixed fee for each such additional sample.

15. Is it advisable to have Analysts' Districts large or small?

Large.

16. Has it often happened that several local authorities have the same Analyst, and where it is so, has it proved successful?

It has frequently occurred, and is certainly desirable.

17. Does it often occur that a private person prosecutes in adulteration cases?

Very rarely.

18. Have the provisions of section 14 of the Act proved sufficient?

They are open to objection, but have answered moderately well.

19 Have the Analysts' reports been collected?

Yes, collected and collated by the Local Government Board and the numerical results published in abstract.

20. Is it advisable for the Analyst to appear in court, and does that often occur?

It is advisable that there should be power for either party to call him if required, on payment to him of a suitable fee. It occurs occasionally here.

21. Have the Inland Revenue Chemists often been appealed to?

In a very few instances.

22. Have they often differed from the Public Analysts?

In about half the number of the very few cases referred to them.

23. Would it be desirable to have a different Court of Appeal?

Yes, decidedly. A Body of Referees should be nominated by the Central Authority, and should consist of Analysts of special experience, to each of whom should be deputed the reference in all disputed cases as to a particular article of food, drink, or drugs—*i.e.*, each referee should have made a special study of some one or more articles, and all disputed cases in reference to those articles should be submitted to him, and he should be liable, on the application of either party, to be called upon to appear in court.

24. Has Section 25 of the Act proved successful?

No. Quite abortive.

25. Would it be advisable that the Analyst should state in his certificate simply that the article is "pure" or "adulterated," or would it be better to state the nature of that adulteration exactly?

It would be better to state as exactly as possible the nature and proportion of the foreign admixture.

26. Would it be advisable to empower the police, with the sanction of the magistrate, to visit suspected beershops, tea stores, factories, &c., to search?

It is desirable that the police or other officers should have power to enter places wherein it is suspected that articles of food which are unfit for the food of man are kept.

27. What qualifications should an Analyst possess?

Analysts should be thoroughly educated chemists, of practical experience, possessed of sufficient skill in the use of the microscope, and of some general knowledge of the more common kinds of poisons and substances injurious to health. The chief point, however, is that their education as chemists, &c., &c., should enable them out of their own resources to meet difficulties as they arise, and to recognize clearly all cases in which their own general or chemical knowledge or the authorities available are not sufficient to enable a decided opinion to be pronounced on a sample.

ON THE EXAMINATION OF HOPS.

By W. E. Porter, F.C.S., &c.

Having been engaged the last few weeks in making a number of examinations of Hops by the ether process or method, which I published in The Analyst for August, 1877, I now send the results of the examination of twelve samples of 1877 or new Hops; these are all what would be called fair samples according to their quality:—F., fine; M., Medium, and L., Low. It will be seen on referring to the 1876 ones,* that the yield of oil, resin, and bitter principle is rather higher than in the new or 1877, the cause of this I believe to be that by age some of the oil is partially oxidised, thereby increasing the weight.

1.—Worcester, F.		2.—Spalt, F.	
Moisture	4.02	Moisture	6.96
Oil, resin, and bitter principle	14.98	Oil, resin, &c.	14.08
3.—East Kent, F.		4.—Worcester, M.	
Moisture	6.15	Moisture	8.10
Oil, resin, &c.	13.60	Oil, resin, &c.	13.35
5.—Kent, M.		6.—Sussex, M.	
Moisture	8.20	Moisture	7.05
Oil, resin, &c.	13.27	Oil, resin, &c.	11.75
7.—Bavaria, M.		8.—American, M.	
Moisture	9.97	Moisture	7.87
Oil, resin, &c.	13.08	Oil, resin, &c.	12.63
9.—Sussex, L.		10.—Sussex, L.	
Moisture	8.55	Moisture	9.87
Oil, resin, &c.	9.95	Oil, resin, &c....	9.23
11.—Poperingho, L.		12.—Worcester, L.	
Moisture	10.25	Moisture	9.20
Oil, resin, &c....	9.25	Oil, resin, &c....	8.60

The ethereal residues from Nos. 1, 2, and 3 had a bright golden tint, all the others were of a greenish hue. The American was of a dark green tint, and when a few drops of the residue was placed in the palm of the hand and rubbed it gave a strong black currant or cat-like odour—evidently valerianic—probably due to too much heat employed in the drying.

The highest yield of oil, resin, &c., was found in Nos. 1 and 2, Worcester and Spalt, both these were dried upon Hopkins' patent kilns. The Spalt were partially dried in the sun and then brought over and finally dried in these kilns. As the process is interesting, and I believe it to be the right method for drying hops in this country, I may perhaps be allowed to state it. It consists of the ordinary square or rectangular kiln, with two floors instead of one, the lower floor being placed about 18 feet above the fires, the second or upper floor a few feet nearer the roof, in the apex of which, under a cowl, is fixed an exhaust fan. By means of this fan a large current of dry warm air is rapidly and continuously passed through the hops at a temperature which should not exceed 100° Faht., enabling the planter to cure his hops without burning them, and without any loss of quality or flavour by the volatilization of the oil, resin, &c. In the process of drying by Hopkins' plan, the upper floor is loaded with green hops, which are there partially dried, all "reek" being carried off by the fan, no matter how dull or heavy the external

* See ANALYST, August, 1877, p. 76.

atmosphere. The upper floor being then opened by a simple apparatus, the partially-cured hops fall gently on to the lower floor nearer the fires, where they are thoroughly deprived of moisture by the current of dry warm air (caused by the exhaust fan), and when finished are drawn out from the lower floor on a moveable tray to the bagging chamber, never once trodden upon, unbroken, without the loss of any farina, full of aroma and bright as when picked from the poles. Meanwhile a fresh load of green hops has been put on the upper floor, a duplicate tray replaces the one drawn out, and by the time the hops as described above are finished, the green hops partially dried on the upper floor are again let down, and so the series continues.

I have been informed that one or two brewers object to my process of analysis because it does not estimate the tannin, but this is easily remedied by estimating it in another portion of the hops. No doubt hops that contain a good per centage of tannin have their value increased as it precipitates the mucilaginous matter in the beer, but the oil, resin, &c., must be of the most value. Out of some number of samples that I have examined I find the tannin to range from 2 to 4.5 per cent.

I find some errors are published respecting the constituents of hops, and it is as well to call attention to them, as they have evidently been copied from one source. The analysis of hops is given as—

Oil	2.00
Lupulin	10.30
Resin	55.00
Lignin	32.00
Loss	.70
	100.00

and directly after an analysis is given of the lupulinic grains containing just the same amount; this of course is a mistake, as hops yield about one-sixth part of these grains; at this rate the oil, lupulin, and resin would be about 11.20 per cent., something near what I find to be the mean of the medium and low samples average.

NOTES ON WATER ANALYSIS.

By Otto Hehner, F.C.S.

Read before the Society of Public Analysts on 14th November, 1877.

All chemists who have to perform water analysis are aware of the importance of examining samples of water in as fresh a state as possible, in order that change in the quantity of the nitrogenous organic constituents may be avoided.

Wanklyn recommends to determine these constituents if possible within 48 hours after the collection of the samples, but I was unable to find any record of experiments made with a view to watch the changes which take place when waters are kept for any length of time. Some numerical results may therefore be of interest after the many general statements which have been made.

I will touch at the same time one or two other questions in relation to the ammonia-process of water analysis.

A sample of very bad water, analysed on January 15th, 1877, yielded—

Free Ammonia	0.6640 in 100,000 parts.
Albuminoid Ammonia	0.0265

The same sample, on September 13th, after eight months, only contained—

Free Ammonia...	0.0012
Albuminoid Ammonia	0.0252

that is to say, the free ammonia had almost entirely disappeared, whilst the albuminoid had remained stationary.

A sample of water, taken from the Croydon sewage outfall, yielded in January—

Free Ammonia...	0.1563
Albuminoid Ammonia	0.0476

The same sample after being kept for eight months—

Free Ammonia...	0.0008
Albuminoid Ammonia	0.0207

Water from the Bourne Culvert, at Croydon, in January—

Free Ammonia...	0.0079
Albuminoid Ammonia	0.0063

And had changed after eight months to—

Free Ammonia...	0.0006
Albuminoid Ammonia	0.0037

Water from the Waddon Mill Ponds, near Croydon, directly after being collected—

Free Ammonia...	0.0144
Albuminoid Ammonia...	0.0099

After eight months—

Free Ammonia...	0.0169
Albuminoid Ammonia...	0.0067

Water from the Croydon Pumping Station, taken in January, 1877, yielded—

Free Ammonia...	0.0018
Albuminoid Ammonia	0.0018

After eight months—

Free Ammonia...	Nil.
Albuminoid Ammonia...	0.0020

And, lastly, a Well Water, analysed in January, 1877, contained—

Free Ammonia...	0.0006
Albuminoid Ammonia...	0.0054

And on September 14th, same sample contained—

Free Ammonia...	Nil.
Albuminoid Ammonia	0.0055

In all but one of these cases the free ammonia had almost entirely disappeared, whilst the albuminoid ammonia had either remained stationery or had diminished. Why these changes were so different in the different samples I am at a loss to explain.

As it has been said that distilled water, containing a little free ammonia, after some time, becomes entirely free from it, I thought it quite possible that also the very dilute standard solution of ammonia, or rather of chloride of ammonium, used in water analysis might lose much of its ammonia.

To test this I prepared a new solution of chloride of ammonium and compared its strength with an old one which had been in use in my laboratory for at least four or five months. Both solutions were found to contain exactly equal amounts of ammonia. It was scertained, also, that the large amount of ammonia contained in the Helenen spring water had not changed to any appreciable extent after a lapse of four months.

I imagined that *life* might have had something to do with these changes, especially as it is known that bacteria have the power of reducing nitrates into nitrites. I therefore started some series of experiments with a view of ascertaining whether animalcules and other organisms had the power of acting upon or eating up the ammonia.

A number of stoppered Winchester quart bottles were filled with ordinary Companies' London water (2½ litres), 1 cubic centimetre of very dilute albuminous urine was added to each, and to some of the bottles 1 cubic centimetre of a sample of Dutch water, swarming with animal and vegetable life of all kinds.

The following are the results of the analyses made day by day ;—

WITHOUT INFUSORIA.

Date.	Free Ammonia.	Albuminoid Ammonia.
Nov. 1	0.0149	0.0239
2	0.0133	0·0262
3	0.0161	0.0234
4	0.0126	0.0174
5	0.0319	0.0098
6	0.0348	?
7	0.0345	0.0061

WITH INFUSORIA.

Date.	Free Ammonia.	Albuminoid Ammonia.
Oct. 31	0.0138	0.0277
Nov. 1	0.0133	0.0264
2	0.0193	0.0229
3	0.0191	0.0238
4	0.0184	0.0182
5	0.0210	0.0153
7	0.0241	0.0089

During the first two days the composition of the water to which infusoria had not been added remained nearly stationary. On the third day, November 4th, the albuminoid ammonia began to diminish, and suddenly, on November 5th, it had greatly fallen, whilst the free ammonia had risen to nearly its threefold amount.

Some allowance must of course be made for the experimental error, unavoidable especially in the case of the determination of ammonia, where we have to deal with exceedingly minute quantities, but on the whole it is certain that the free ammonia increased, whilst the albuminoid substances disappeared.

In the second series the changes are far more regular, the free ammonia not rising as high as in the case of the waters to which infusoria had been added, but the general result being the same.

These results seem entirely at variance with the figures I have quoted of waters which had been kept as long as eight months, but it appears from a third series of experiments that on keeping waters for some time the free ammonia in its turn disappears, by oxydation or otherwise.

Date.	Free Ammonia.	Albuminoid Ammonia.
Sept. 17	0 0580	0.0817
Oct. 30	0.0151	0.0397
Nov. 10	0.0139	0.0279

All these experiments were made in the colder autumn months, and it is probable that the changes would have taken place in a shorter time had the temperature been higher. But yet it seems established that the amounts of both the free and the albuminoid ammonia alter considerably in the course of very few days. As a further instance I may

quote the following results obtained by the analysis of a water sent to me. On November 7th it yielded—

Free Ammonia...	0.0155
Albuminoid Ammonia...	0.0204

On November 10th it had changed to—

Free Ammonia...	0.0189
Albuminoid Ammonia...	0.0186

these results have been checked by duplex determinations.

It was formerly generally recommended to add to half a litre of water, to be tested for free ammonia, either 2 grammes of carbonate of soda or 15 c.c. of a saturated solution of this salt. But in the latest edition of Wanklyn's "Water Analysis" it is stated that this addition may be dispensed with, except in the case of acid waters; and, I believe, many chemists now altogether omit the use of carbonate of soda. Feeling some doubt as to this point, I made the following experiments:—

500 c.c. of ordinary London companies' water were boiled in a retort, without any addition until all free ammonia had distilled over. 10 c.c. of standard chloride of ammonium solution, containing 0.0001 gramme of ammonia, were then added; the distillation continued until no more ammonia could be detected in the distillate, and the amount of free ammonia which had come over determined. Found 0.0192 free ammonia in 100,000 parts of water, instead of 0.020 as added.

To decide whether the carbonates of lime and magnesia played any part in this decomposition of the chloride of ammonium solution 10 c.c. of standard solution were added to 500 c.c. of pure distilled water without any further addition being made. The distillate contained 0.0194 ammonia in 100,000 parts of water, instead of 0.020 as added.

A similar experiment with distilled water, magnesium chloride, and 0.1 milligramme of ammonia yielded in the distillate 0.0211 ammonia per 100,000 parts of water. Magnesium chloride is therefore without influence upon the result. The addition of carbonate of soda may consequently safely be dispensed with in the case of alkaline waters, and such as contain either carbonates or chlorides of calcium and magnesium.

The possibility of distilling all ammonia from such waters, without any addition of carbonate of soda, is therefore solely due to the fact that dissociation takes place in the boiling solution, the ammoniacal salts splitting up, as Fittig has shown in 1863, into free ammonia, which volatilises with the aqueous vapours and acid remaining in the retort. According to the experiments of Dibbitz (Zutschrif f. anal., Chem. xiii. 4) dilute solutions of chloride of ammonium lose up to 1 per cent., of sulphate of ammonia up to 2½ per cent., and of oxalate of ammonia as much as 24 per cent. of the total ammonia.

Acid waters, no doubt, are exceedingly rare, yet I also made an experiment to ascertain the influence of the presence of a strong acid on the determination of the free ammonia.

500 c.c. of pure distilled water were boiled with 0.5 c.c. deci. sulphuric acid, containing 2 milligrammes of SO_3 and 10 c.c., or 0.0001 ammonia, were added. The distillate contained but 0.0011 of ammonia calculated for 100,000 parts. The acid had therefore almost completely retained the ammonia.

In conclusion, I beg to direct your attention to the graduated tapped nesslerizing cylinders, which I have used for some years past. I find them extremely convenient effecting a great saving of time, trouble and distilled water.

SANITAS.

So long as the notices of the new disinfectant "Sanitas" in the various periodicals of the day were limited to the "advertisement" or "trade notices" columns, it was not the business of anyone to examine, except privately, its merits or demerits. Now, however, that the representatives of the papers have been invited to inspect its manufacture, and a long article has appeared on it in the leading journal, the matter becomes public property. We purpose, we hope dispassionately, and certainly with no hostile intention, to give our views upon its advantages or otherwise, from a purely scientific point of view. Our remarks will be chiefly directed to ascertain whether or not Mr. Kingzett's discoveries have made any real advance in practical sanitary science by giving us an agent both cheaper and more active than we already possess.

Sanitas consists, essentially, of a dilute aqeous solution of camphoric acid and peroxide of hydrogen. To the former its antiseptic, and to the latter its disinfecting properties are mainly due; both these, however, are, we fear, of a comparatively feeble character. Thus, in some experiments, we made an addition of as much as 5 per cent. of sanitas to milk, the result being only that it kept it sweet for an extra 16 hours, while additions of 2 or 3 per cent. had no appreciable effect whatever. As an antiseptic, such a dilute solution of camphoric acid may therefore be dismissed from consideration. Its disinfecting power are, we fear, but little higher. The sample (bought at the rate of 1s. for 5 ounces) contained 0.55 per cent. of peroxide of hydrogen, equal to 0.26 per cent. of available oxygen, or one volume of sanitas contained 1.82 volume of available oxygen; we are informed, however, that in some samples this proportion rises to 2 volumes. Taking, then, this latter proportion as the basis for our calculation, we find that 1 litre of available oxygen when bought in the form of sanitas, will come to 8d., since we are given to understand that, at wholesale price, 1 gallon of sanitas (about 4½ litres) could be sold for 6s.* Now the kilo. of permanganate of potassium can be bought retail for 8s., and contains no less than 175 litres of available oxygen, or at the rate of a little over one halfpenny per litre. As a disinfecting or oxydizing agent sanitas thus can bear no comparison, at least in price, to permanganate, and it is a curious illustration of the superior oxydizing power of the latter that the organic matters contained in sanitas, and which are not acted on by the peroxide, are further oxydized by permanganate. A further advantage of the permanganate is. that in the solid form, or at its maximum concentration, it is absolutely staple, whereas even dilute solutions of peroxide of hydrogen are liable to suffer decomposition, and consequent deterioration. One great advantage sanitas certainly possesses over permanganate, it does not stain, and its being used at all is, we are inclined to believe, entirely due to this fact.

Sanitas is an attempt, and we freely confess, a very creditable attempt, to imitate one of the great purifying processes of nature. Mr. Kingzett has, however, overlooked one great factor in this process, or at least he does not enable us to realize it in its entirety. Nature not only makes use of certain agents, but uses them in, practically, limitless quantities, and we are expected to follow her example by using drops where she would employ rivers. Sanitas may have many good qualities, but we fear cost will bar its practical use.

* In our above-mentioned samples of sanitas the litre of available oxygen comes to no less than 4s.

A TEST FOR CITRIC ACID.

By A. Sabanin and N. Laskowsky

(Zeitschr. f. Anal. Chem., xvii. 1).

Sarandinaki was the first to show that on heating an aqueous solution of citrate of ammonia, or of citric triathylic ether to 110°C in a closed tube, a substance is formed possessing an intense bluish green colour.

The authors, on heating citric acid with an excess of ammonia (for about six hours) to 120°C, obtained a liquid of a slightly yellow colouration, which on exposure to the air in a porcelain basin, in the course of a few hours assumed an intensely blue tint, which in the course of a few days changed to green. Exposure to light hastened the appearance of the blue colour, whilst on prolonging the heating, or raising the temperature to 150°C, the green product was at once obtained.

10 milligrammes of citric acid, and 2 or 3 c.c. of ammonia thus yielded a very strong and decisive reaction, half that quantity of citric acid sometimes failing to yield the blue liquid.

Oxalic, tartaric, malic, and similar organic acids, with the exception of aconitic acid, do not produce the reaction.

To detect citric acid in the juices of fruits, they are mixed with an equal volume of alcohol, and after some hours the filtrate is precipitated by means of acetate of lead solution. The precipitate is washed, ammonia is added to it, the solution evaporated to remove excess of ammonia, and then decomposed by means of sulphuretted hydrogen. To the filtrate acetate of baryta is added, the liquid is boiled, the precipitate separated by filtration, washed and decomposed by means of dilute sulphuric acid. The liquid thus obtained is concentrated, super-saturated with ammonia, and heated in closed tubes as directed.

Thus citric acid may readily be detected in the juices of the bilberry and the currant, whilst contrary to usual statements the juice of the apple was found to be entirely free from it.

Though complicated, this is claimed to be the most characteristic and delicate test for citric acid known.

CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

To the Editor of "The Analyst."

Sir,—Referring to the salt in beer question, I think I ought to state that I have several times found as much as 58 and 60 grains salt per gallon in Allsopp's best quality of pale ale, supplied to my own house in barrels, and I think also in other brands; and that I long ago, before the passing of the Adulteration Act of '72, decided not to find fault with any ale which was of good strength, and contained no more than 70 grains per gallon, or 0·1 per cent.

Of course this quantity never came entirely from water, malt, and hops; but it is not objectionable to use a *small* quantity of salt in extending the malt.

Yours, &c.,

J. CAMPBELL BROWN.

To the Editor of "The Analyst."

My letter to you, respecting amount of salt in our Beers, of the 23rd October, as published, is totally incorrect as to substance; the figures are right.

My assertion and assurance to you should be that none of our Beers that I have examined contain salt 50.87 grs. = 20 grs. sodium per gallon; that our usual brewing waters contain chlorine = to 5.10 or 5.35 grs. sodium; and that the sample of Beer reported on contained chlorine = to 15.6 grs. sodium. The quantity of sodium found being 15.05 grs. only.

Hoping in a day or two to be able to trace the cause of the inaccuracy, when I will write you again and send subscription,

I am, Sir, yours faithfully,

WILLIAM KIRK.

Chemist to the Burton Brewery Company.

[Mr. Kirk has since informed us that the incorrections in his first letter to which he refers were caused by some mistake in his office—part only of his letter having been sent to us.—Ed. Analyst.]

To the Editor of "The Analyst."

Sir,—On June 2nd, 1876, Mr. W. C. Young gave us an account (Proceedings pp. 159), of some interesting experiments made by him on the volumetric estimation of chlorides in the presence of alkaline phosphates, his very cogent deductions were, that "the volumetric estimation of chlorine in the ash of vinegar, beer, "milk, or cocoa is affected more or less by the alkaline phosphates present."

Now in the face of this, he on the 14th November, 1877, recommends us to estimate with standard nitrate of silver, the total chlorine, and this in the presence of alkaline phosphates; if the substance of the former paper is correct, the second must necessarily contain fallacious information, and *vice versa.*

Mr. Young does not in his second paper make any mention of the fact, that he found the phosphates to interfere seriously with the determination. If he had done so one would have inferred that the phosphoric acid has to be removed before the chlorine could be estimated, the method would then become still more complicated.

Two quantitative determinations according to Mr. Young are necessary in order to arrive at a qualitative result; namely to decide in the first instance whether a given sample of vinegar, contains sulphuric acid or no.

Again in mentioning the methods "most commonly used for the determination of sulphuric acid in vinegar," Mr. Young has either completely forgotten Hehner's method given in August, 1876, (Analyst, page 105, vol., 1,) or else he has tried it, and finds it not reliable, if the latter, then his experience is diametrically at variance with my own. As far as I have gone I have found Hehner's method to be quick and reliable, and believe it to be based upon good chemical principles. The qualitative examination of a sample can be conducted in a few seconds, and the estimation of mineral acids can be safely made in a reasonable time. Yours, &c., ARTHUR ANGELL.

ANALYSTS' REPORTS.

Mr. E. W. T. Jones, Public Analyst for the County of Stafford, in his Report for the quarter ending Michaelmas last, states that he examined 207 samples, of which 32 or 15.45 per cent. were adulterated. These included 4 samples of coffee adulterated with chicory; 13 of gin, varying from 37.0° to 54.4° under proof; 1 of milk, adulterated with 19 per cent. added water; 2 samples of mustard contained wheat flour; 6 samples of oatmeal contained sharps and barley meal; 1 sample of whisky was 47.4° under proof, and 5 samples of pills were not what they were sold as.

Mr. A. J. M. Edger, Public Analyst for the County of Durham, reports that during the quarter ending Michaelmas last he analysed 208 samples. 74 of them being adulterated, viz., 50 samples of various spirits, 2 of oatmeal, 8 of pepper, 5 of soda water, 1 of mustard, 1 of cider, and 7 of milk.

The ungenial weather has not damped the ardour, nor abated the contentions of the analysts. Into that troubled region we shall decidedly not venture; it is simply our duty to call attention to the doubts expressed as to the sufficiency of the authorities at Somerset House to be constituted as a Court of Appeal. Recent circumstances have deepened those doubts, particularly a dictum pronounced on Burton ale, which stated that strong Burton beers contain about 60 grains of common salt per gallon, solely derived from the water, malt, and hops used. Naturally the Burton brewers resent the statement, and assure the world that the water used contains from 5·10 grains to 5·35 grains of chlorine per gallon; that no ale leaves the brewery containing 20 grains of salt per gallon; that in no case is there a concentration to one half, and that salt is not used nor any matters to form it. The general public, moreover, must be credited with common sense—the community at large is not likely to extend its patronage to a beverage which is nothing but a flavoured solution of sodium chloride.—*Chemist and Druggist.*

LAW REPORTS.

At Southwark, Messrs. Walter Jacob Maas, James Frith, and Alexander Frith, of Ewer Street, Union Street, Borough, were summoned by Alexander Francis, of 24, Barford Street, Islington, for that on the 21st Nov. they did sell him 2 cwt. of white clover seed dyed, with intent to defraud him, and they were further charged with causing the same to be dyed. Mr. Besley prosecuted; Mr. Edward Clarke appeared for Messrs. Maas & Co., and Mr. Washington for Mr. Harley. Mr. Besley said the proceedings were taken under the Adulteration of Seeds' Act, rendering the defendants liable to penalties of £5 on the first and to £50 on the second conviction. Mr. Benson asked what was the object of killing seed. Mr. Besley replied that charlock seed was similar to turnip seed, and it was killed and mixed with good seed. These cases were for dyeing seed, which fortunately had not proceeded to any great extent, and it was with the view of putting a stop to such fraud that the present proceedings were taken. He was glad to say that there were only two or three firms which carried it on, and after calling the necessary evidence he would ask his worship to inflict the penalties according to the Act of Parliament. Mr. Clarke observed that it was not an offence to dye the seed. Mr. John Charles Ostler said he lived at Walthamstow. On the 12th of August he called at Messrs. Maas and Frith's place, in Ewer Street, and saw James Frith. On the 16th Nov. he was with Mr. Robinson, and a sample of low white clover was shown to Mr. Francis. Mr. Clarke objected to the evidence of this witness, when Mr. Besley called Mr. Francis, who said he was a commercial traveller, and on the 16th Nov. he was at Robinson's place, in Snow's Fields, when a sample of seed (produced) was handed to him. It appeared to be the screenings of white clover. He saw some of it was worm-eaten and unfit for sowing. There was grass seed in it. Mr. Robinson produced him an invoice. He gave Robinson a £10 note. He gave witness the receipt. At the same time the delivery order was handed to him. Mr. Ostler, resuming his evidence, said he saw the seed come to Robinson in two sacks, and it came from Frith and Co., Ewer Street. The sacks were opened, and their contents smelt strongly of sulphur. He took samples, and handed them to Mr. Dyer, consulting chemist, 17, Great Tower Street, E.C. Mr. Bernard Dyer, F.C.S., Member of the Society of Analysts, said on the 7th ult. he received two samples from Mr. Francis. On examining them and submitting them to chemical analysis he found that a great deal of sulphur in the form of sulphuric acid, one grain to the ounce, had been introduced. He would not say that sulphur would kill seed. Mr. Benson asked if he knew anything of the process. Witness replied that he did not know what the defendants did, but worthless seed was usually placed on hair cloth and submitted to sulphur fumes. It was entirely worthless. The only object was to give it the appearance of genuine seed. By Mr. Clarke.—Many of the seeds so called were hollow shells. He had been in practice three years, and prior to that had been for three years assistant to Dr. Voelcker. Mr. Benson asked if a farmer would know whether the seed was good or bad. Witness replied that many farmers were deceived by such seeds. Mr. Besley here said that was all the evidence he had to offer in the case. Mr. Clarke contended that there was no evidence before his worship. Mr. Benson said he regretted very much that such was the case, and he was bound to dismiss the summons.—*Times*.

Bow Street.—Milk Adulteration.—Edward Stone was charged on remand, before Mr. Flowers, with putting eight quarts of dirty water to some milk belong to his employer, Mr. Henry Hanson, milk dealer, at 76, Great Queen Street. The prisoner on the last occasion did not deny that he put the dirty water into the milk, but cross-examined Mr. Hanson to show that he had been in the habit of making his men, when the milk run short, mix a quantity of white stuff that was kept in a cellar with water, and take out to the customers to make good the deficiency in the supply of good milk. This process he called the "fake" of the trade. Mr. Hanson admitted that he kept condensed milk to make up the supply when the demand was too great. The "white stuff" referred to by the prisoner was the condensed milk. On the prisoner being now placed before Mr. Flowers, Mr. Winch, for the prosecution, said since the adjournment inquiries had been made and these had resulted in showing that the prisoner had been a respectable man, and under these circumstances the prosecution did not wish to press the charge. The prisoner's cross-examination had elicited from Mr. Hanson that he did use condensed milk with water put to it. Mr. Hanson did not wish to withdraw that admission; but he urged that there was no evidence that that milk was sold to customers without their knowing what it was.—Mr. Flowers: No, there's no evidence of that. Mr. Winch said he hoped, therefore, his worship would not assume that it had been sold without such knowledge.—Mr. Hanson also called attention to the fact that the condensed milk cost him more than the good milk sent up by the farmers. It was well known in the trade that at this time of year milk sellers were put to great difficulty to supply their customers, and had to submit to loss by using this condensed milk. Mr. Hanson wished the case to be dealt with as one of wilful damage to property.—Mr. Flowers was of opinion that the prisoner had really stolen the milk, and he should therefore not impose a fine, but should sentence him to two months' imprisonment.—*Daily Telegraph*.

Beer Adulteration.—Robert Kirby, landlord of the Albert beer-house, Milford-street, Clapham, was summoned at the Wandsworth Police-court, to answer two counts in an Excise information,

for having a certain article upon his premises as a substitute for malt and mixing sugar with beer.—It appeared from the evidence of two officers of Inland Revenue, named Pargeter and Cook, that on the 24th September last they visited the defendant's house for the purpose of examining the cellar. On the stairs Mr. Pargeter found two stone jars, one full of treacle, and the other partly full. Half-way down the stairs he found three bags containing loaf sugar. He examined a cask of ale which had recently been refined, and found traces of sugar, salt, and water. He told the landlord that he had been mixing his ale. He said he had not. He told him that he had mixed sugar, water, and salt with it. He replied that it was of no use to deceive him; that he had put 1lb of sugar, a gallon of water, and a handful of salt in the barrel. The officer examined a barrel of porter, and found that it had been mixed. The defendant said he used the treacle in the porter and the sugar for the ale. The sugar and treacle were seized by the officers.—Mr. Paget dealt with the first count, the second being withdrawn. He said he should reduce the penalty of £200 to one-fourth. If deleterious articles had been found he should have imposed the full penalty, as it was most important that a pure article should be sold. He then imposed a penalty of £50. *Standard.*

Adulterated Butter.—At Lynn Petty Sessions, before the Mayor and other magistrates, William Clark, a "peripatetic provision merchant," who regularly attends various markets in the Eastern Counties was charged by Superintendent Ware, with selling in the Lynn market a spurious article, which he alleged to be butter. Defendant was represented by Mr. Oliver, of 23, Newington Road, London, who stated that he was instructed by the defendant to plead guilty to the charge. Superintendent Ware said the defendant represented himself as of 2, St. Pauls-terrace, New Southwark, London. He visited defendant's stall on the Market place on Tuesday, October 30, and found thereon a quantity of cheese, bacon, and what appeared to be butter, and these he was offering for sale. There was a crowd standing round the stall, and witness saw several persons purchase the butter. Witness proved the purchase and division of the sample. Defendant had been in the habit of attending Lynn Market for months past. Mr. W. M. Hamlet the Public Analyst produced his certified analysis of the butter handed to him by Superintendent Ware, and it showed that the sample contained:—Foreign fats other than butter, 83·19; salt, 3·06; insoluble residue, 5·61; water, 8·14; total 100·00. Specific gravity at 100° Fahr., 908·6. Soluble acids—i., 1·1; ii., 1·1. Insoluble acids—i., 95·0; ii., 94·8. Defendant was fined £5, including costs.

A Milk Adulterator caught "in Flagrante Delicto."—At the Barrow Magistrates' Court James Hexton was charged with selling adulterated milk. Mr. Nalder appeared on behalf of the defendant. Supt. Barker stated that the defendant was a milk dealer, and on the 3rd inst. he purchased a pint of new milk from him, for which he paid 2d. He produced the certificate of the county analyst, who had analysed the sample forwarded to him, which showed it to be adulterated to the extent of 10 per cent. with water.—Mr. Nalder: Have you always found defendant to be a respectable dealer in milk?—Supt. Barker: I have found he is not a respectable dealer in milk.—Mr. Nalder: Then you have not complied with your duty, in not bringing him before the magistrates before. John Marshall Tyson, farmer, Billingcoat, stated that on the 3rd inst. defendant purchased 20 gallons of milk from him. When he received it, it was just as they had got it from the cows. The price was 11d. per gallon in winter, and 10d. in summer. P.C. Pincock, stationed at Furness Abbey, said in consequence of information received from Supt. Barker, he, from behind a hedge, watched defendant on the 3rd inst. returning from Billingcoat farm. On the road there is a water trough, and witness saw him fill a can, which would hold three gallons, with water, and add it to the milk. Supt. Barker: This well is not a very clear one. Inspector Barlow spoke to serving summons upon the defendant, when he admitted having watered the milk, but gave as a reason for doing so that his customers were determined to have the milk, and in order to keep them, he had watered it to make the quantity larger, as he could not get any more from the farmer. Supt. Barker asked for the imposition of the full penalty. He could show that the defendant could not have been making less than £2 or £3 a week more than he would ordinarily have done. The bench inflicted a fine of £5 and costs.

A Milk Case.—Richard Thompson, Pond Street, sued James Morris, River Street, Pond-hill, milk dealer, for £2 19s. 6d. being the amount of fine and costs which the former had to pay through having sold milk obtained from the latter, and which at the Town Hall was pronounced to be watered. Mr. Clegg was for the plaintiff, and Mr. A. S. Binney defended. The plaintiff's wife got a quantity of milk from the defendant for sale, but when a quart was bought by the inspector, and it was analysed, it was found to be adulterated with water. Consequently Mr. Thompson was fined £2 and 19s. 6d. costs, which she tried to get Morris to pay. He had promised to see her "all right" at the Town Hall, but did not, nor could she induce him to pay the amount. She had never watered the milk herself. Morris also denied having watered the milk, and a servant of his said she had never seen it watered. His Honour supposed it would not be done publicly if it were done. The defendant however admitted having been fined for selling watered milk, but then that had been bought from another dealer. His Honour who commented strongly on the fact that the defendant had not appeared at the Town Hall when we knew his character as a dealer in milk would be challenged, gave judgment for the amount claimed with costs.

NOTES OF THE MONTH.

We commend the following advertisement to the notice not only of brewers who may be in trouble, but also to those professional chemists who are of opinion, as we are, that the analysis of a water "for brewing purposes" involves a considerable amount of work. There can be no doubt that it would be more respectable to be a crossing sweeper than to practise the analysis of water "for brewing purposes" on the terms this advertiser professes to do (of course we suppress the address):—

"Waters tested, examined, and reported on with reference to their fitness for brewing purposes. FEE, TEN AND SIXPENCE. A half-gallon sample must be forwarded, carriage paid. Complete analyses 3gs. and 5gs. Analyses and examinations of barley, malt, sugar, hops, beer, yeast, &c. Advice and consultations upon all matters relating to the Chemistry of Brewing, either personally or by correspondence. Instructions given in Practical Chemistry.—T.A.B.Sc., F.C.S., Chemical Laboratory. * * *"

Chemistry is evidently becoming more and more an exact science. One of our contemporaries recently went out of its way to inform its readers that carbolic acid is soluble in water, while the other oils are not.

When *The Grocer* weeps over the sad fact that "adulteration flourishes," it is not out of place for us to regret it. Certainly it is a sign of the times that the adulterating community are no longer defended even by their trade journal. Perhaps soon we may have an immaculate *Grocer* advocating purity instead of floured mustard and watered milk.

The Gin dealers are in hard straits. The recent decisions really mean that they are prohibited from watering their gin at all. We say quite right. There is no reason at all why a milkman should be fined and a publican let off. One of the most curious features of the whole matter is the way in which the publicans have rushed over to the teetotal side of the argument, and urged that they only diluted the gin, because if they did not it was too strong for their customers. Poor customers—Was the price reduced as well as the spirit? Of course the *Brewers' Guardian* sees a "very broad distinction between adulteration and dilution." We cannot. Why should water be sold at the price of gin any more than at the price of milk?

We notice with great pleasure that Professor Abel has been made a *C.B.* Probably it would have been hard to find among chemists a more fitting recipient for such an honour.

We publish more letters this month as to the Salt in Beer question. Dr. Campbell Brown's results are of course unquestionable, but it is quite clear that the Burton brewers must draw their water and salt from sundry and diverse springs, for we recently had a sample of Allsopp's ale which contained less than three grains of salt per gallon. We would also call attention to Dr. Bernays' report to the Camberwell Vestry, where he refers to some very astonishing instances of the quantity of salt he has found in beer since the recent Somerset House dictum (?) was issued.

The following paragraph, which we reprint from a leading article in the *Grocer*, and refer to more fully on another page, will be read with interest and probably amazement:—

"In one form and another, adulteration seems to be rampant everywhere; and what is still more serious, it almost defies both the vigilance of inspectors and analysts to suppress it, and stern Acts of Parliament to stamp it out. Adulteration flourishes in defiance of all enactments and safeguards; and, humiliating and deplorable as it is to confess, no one can scarcely lay his finger upon an article of food, clothing, or manufacture that is not in some respects shamefully adulterated. To combat with and describe one-tenth part of the evil would occupy more time and space than we can devote to so vast a subject, and we therefore merely allude to it incidentally for the purpose of bringing more prominently under the notice of our readers the case of adulteration of seeds reported in our last issue, where the offender was convicted on the clearest evidence, and substantially fined."

ALDERMAN ROOKE ON GIN AND HIS OWN TRADE.—Yesterday afternoon a Meeting of the York Licensed Victuallers' Association was held at the York Hotel, to consider the recent prosecutions against publicans and others for selling diluted gin. Mr. Alderman Rooke occupied the chair. . . "Mr. Rooke went on to say that the other day an acute friend of his, for whom he had the greatest regard, asked him why, if people were fined for mixing water with milk, the same course should not be adopted with regard to gin. His reply was then, as now, that milk was an article of food; that it was the only food which infants could take, and that therefore water added to it injured its nutritive properties. This was not the case with gin. Gin was an intoxicant, and water did not injure its properties. Besides, many people had died from the effects of taking strong gin. The ignorance of the laws and customs regulating the trade, which pervaded the minds of the magistrates and the judges, seemed to him to be extraordinary. The great vice of all these convictions was that it was an attempt to limit the profits of the publicans, thus setting aside every sound maxim of political economy." . . . "What was the trade of the publican? His house was never his own. He had to suffer all the taunts and insults of every blackguard who enter it, and if he refused to serve a man there was very often a scuffle, in which he perhaps came off the second best. The present state of affairs must not go on much longer, and they must do what they could to prevent it."—*York Herald.*

A correspondence has appeared in a Glasgow contemporary as to what is called by the writers "adulterated sugar." They complain of the noxious smell and want of sweetening property which are the leading features in most of the sugar sold in the "metropolis of Scotland." Two writers in a recent issue of the paper explain the cause—viz., the large quantity of beetroot sugar which finds its way into the market, which, either for smell or for sweetness, cannot be compared to the produce of the cane. As a proof of the increase in the quantity of beetroot sugar used, one writer says that, out of 28,000 tons landed last month at Greenock, about 24,000 tons were beetroot. We think it probable that changes now in progress will soon largely increase the importation of cane sugar.

OBITUARY.

WE regret to announce the death on Dec. 20th, at Paris, of Henry Daniel Ruhmkorff, whose name is so closely connected with the history of magneto-electricity. He was born in Hanover in 1803. In 1844 he brought out his first invention, a thermo-electric battery, and in 1851 the famous "Ruhmkorff Coil," which was rewarded by a medal and decoration at the Exhibition of 1855, and in 1858 it received the prize of 50,000fr. at the French Exhibition of Electrical Apparatus. M. Ruhmkorff was a Member of the French Physical Society

Professor Abel, the late President of the Chemical Society, and one of the honorary members of the Society of Public Analysts, has been nominated to the Companionship of the Bath. Dr. Playfair, another honorary member, is said to be the only other chemist who enjoys that distinction.

Mr. Arthur Angell, Public Analyst for the county of Southampton, has been appointed Public Analyst for the Borough of Guildford.

SUBSCRIBER will most satisfactorily obtain the information he requires by consulting Church's *Laboratory Guide*, published by Von Voorst, London.

SALT IN BEER.—We extract the following from the last report of Professor Bernays, Public Analyst for Camberwell:—"In the past quarter I have examined eleven specimens of beers, ales, and porters. As to alcohol, except in a spruce beer which contained 14·3 per cent., the variation was only between 8 and 10·5 per cent. The same lack of hops is exhibited as of old; at least a little goes a long way. But the most curious feature is in the increase of salt. It will perhaps be remembered how often I have mentioned the almost absence of salt in days gone by. Now, however, we have arrived at a quantity, in the case of No. 70, so large that I ventured to obtain a magisterial decision and a penalty, reduced at the request of Mr. Marsden from £10 to £5, together with costs. May I give examples, stating the grains per gallon?—No. 57, not estimable; 58, 5·60; 59, 11·20; 68, 13·30; 67, 30·10; —, 32·90; 63, 34·30; 61, 44·10; 60, 47·69; 69, 58·10; 70, 82·60. Here, then, we have, from a merely nominal presence, as much as 82 three-fifths grains in a gallon—a quantity sufficient to induce thirst and to encourage drunkenness."

Publicans are now being fined throughout the country for gin as high as twenty-seven and thirty under proof; and although gin is known to be sold at two or three prices, and necessarily, therefore, at two or three qualities, still whatever sort be asked for the magistrates seem to conclude that the best ought to be sold. Without any desire to encourage adulteration in any shape, we cannot but think that the same Legislature which derives so enormous a revenue from spirits that they cannot be sold at a reasonable price, did not intend by legal enactment to make the sale of them impossible; and that the trade are in the right in asking some redress. There is a very broad distinction between *adulteration and dilution*—although to the latter there must be some limit—and the law, as at present strained, is equally hard on the honest as the dishonest trader.—*Brewers' Guardian.*

RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
638	J. C. Swan	Purifying Drainage from Alkali Waste	2d.
1587	J. and J. Kidd	Carburetting Gas and Air	2d.
1619	M. H. Synge	Apparatus for Filtering and Purifying Sewage	6d.
1632	G. W. Weatherhogg	Apparatus for Carburetting Atmospheric Air	6d.
1640	W. R. Lake	Chemical Telegraphs	10d.
1668	G. S. Hazlehurst	Condensing Noxious and other Gases and Vapours	6d.
1733	E. K. Muspratt	Furnaces for the production of Sulphate of Soda or Potash	2d.
1760	W. James and J. Walsh	Apparatus for Manufacture of Sulphates of Soda and Potash, &c.	2d.
1835	L. Locurenthal	Gases for Purifying Noxious Vapours, &c.	6d.
1806	J. H. Morgan	Disinfecting Compound	2d.
1910	F. W. Heinke	Producing Electric Light	2d.
1958	B. C. Molloy and J. D. Warren	Using and Producing Nitric Acid	4d.
1982	J. Fenton	Defecating and Deodorizing Sewage	2d.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Medical Record; The Miller; The Anti-Adulteration Review; Journal of Applied Science; The Country Brewers' Gazette.

THE ANALYST.

MIS-INTERPRETATIONS OF THE SALE OF FOOD AND DRUGS' ACT.

SEVERAL recent decisions under this Act present such striking instances of mis-interpretation that we think it necessary to call special attention to them, in order, not only that they may be considered by analysts in the certificates they give, but also that the ground may be more prepared for bringing them at the earliest opportunity under the notice of Parliament.

The first, and perhaps most important of these decisions, is in a case reported on another page, in which a milk dealer at Glasgow had been summoned for selling to an inspector, cream containing "more than 50 per cent. of the other ingredients of milk;" the Sheriff convicted the defendant, and imposed a fine of £2. The defendant appealed to the Justiciary Appeal Court, and the argument against the conviction was that the inspector was not prejudiced by having purchased an article of this quality, that in fact it was quite immaterial to him as a public officer, buying the article solely for analysis, whether it was pure or impure, as under no circumstances would he consume any part of it. Several other questions were raised, all of them with the singular persistency which seeks technical points of defence, instead of accepting the broad principle of appeal to the chemists at Somerset House laid down by the Act, but the point as to prejudice was the only one on which the decision was given in favour of the defendant, and here the Lord Justice Clerk was distinctly of opinion that the conviction could not stand, and four of the other lords who sat with him arrived at the same conclusion and concurred in the decision, while two other judges thought that the judgment should be allowed to stand. It is worth noting, however—if the reports in the Glasgow papers of the grounds on which Lord Adam and Lord Craighill dissented from the opinions of the other judges is correct—that they did not dissent because they thought the inspector was really prejudiced, or that the terms of the Act had been fulfilled, but simply because they thought that, under the circumstances, it was not competent to the defendant to have appealed at all—in other words, they thought the original conviction was wrong, but that they had no power to set it right. It does not need any words of ours to show that if such a decision as this is to be upheld, the Act is entirely a dead letter, except as regards those other clauses, under which it is still possible to charge offenders. Thus for instance, it would still be possible to charge a vendor under the 3rd, *i.e.* the injurious to health section, or under the 4th, which is the drug section, or under the 7th, viz., the compound article section, or under the 9th section, which relates to abstraction, but it is seldom that it is convenient to proceed under any of these different sections. Should the English magistrates or judges on appeal, follow this Scotch decision, it is clear that any Bill to be brought before Parliament for amending the Act, must deal with the question as to "prejudice."

The next case to which we must refer, is the prosecution of a publican for selling beer containing a quantity of salt, which was commenced before the issue of our last number, but as the decision was not given we held over the report. We now reprint a rather full report, and it will be seen that the magistrate's decision amounts virtually to this:—that if, as he believes is the case, the brewers have put the salt into the beer, it

is impossible to proceed against the publican; and carrying it still further, we may infer from his remarks that he has very great doubts whether the salt was put in as a necessary constituent of the sugar or as a deliberate adulteration. This case has evoked a considerable amount of discussion in the brewing papers, some of which has taken an undesirable personal tone. It seems to be generally admitted now by nearly all the parties to the controversy, that the sugar introduced in the brewing of the beer in question was specially prepared sugar, sold under the name of "brewers' concrete," which contained a larger quantity of common salt than could ever be present in genuine sugar made either from cane or beet. If this is so, it appears to us that the adulteration is quite as clearly shown by the proof of the addition of salt to the sugar, as if the salt had been added to the beer itself. One of the defendant's witnesses swore that he had analysed this sugar, and that the quantity of salt it contained was sufficient to account for more than 50 grains of total chlorides per gallon. As pure sugar is absolutely free from chlorides, and even the grossly impure sugar used for brewing purposes contains only an infinitessimal quantity, this certainly appears to us a bad case of adulteration.

Another case we must allude to:—A Metropolitan magistrate has decided that the note to the Schedule of the Act, giving the form of certificate which should be adopted, and which states "where the article cannot conveniently be weighed, this (the weight) may be omitted," is insufficient to protect analysts from the necessity of weighing every sample as they receive it. The magistrate thinks that it is quite convenient for an analyst to have balances in his laboratory capable of weighing anything up to a quartern loaf or a gallon of beer, and although considerate enough to say that he thought the nearest ounce would be sufficient, yet he insisted on the weight being put in the certificate. If this decision is followed generally, analysts work will be again inconveniently increased to serve no useful purpose whatever.

We do not think we ought to conclude this article without calling attention to the resolution passed at the last meeting of the Society of Public Analysts with reference to the Inland Revenue Chemists, and expressing our earnest hope that the latter will accede to the Society's request.

SOCIETY OF PUBLIC ANALYSTS.

The Anniversary Meeting was held on the 16th January, 1878, at Burlington House, Piccadilly, the President, Dr. Dupré, F.R.S., in the Chair.

The Minutes of the previous Meeting were read and confirmed.

The President delivered the annual address. He said:—

It is a pleasant thing for me for the second time to congratulate the members of this Society on the return of an Anniversary Meeting, when we may take, as it were, a fresh start on our career, and it is still more satisfactory that we can make this fresh start with an outlook for the future which certainly embraces some points more satisfactory than was the case at our last Anniversary Meeting.

The past year has not been free from analytical troubles and disturbances, and the Society of Public Analysts has certainly not been exempted from them. Referring, as briefly as I can to the principal events which have interested us as a Society during the year, it is natural to notice first of all the erroneous interpretations which, from time to time, have been made of the Sale of Food and Drugs' Act, and as a natural conse-

quence, the several miscarriages of justice which have taken place. Among the latest of these mis-interpretations I may notice that the Glasgow Magistrates have positively refused to convict tradesmen selling adulterated goods on the evidence of an inspector, because, they say, the inspectors were not prejudiced by the purchase, as they only bought them for the purpose of analysis. It is scarcely necessary to remark that such a decision as this is in direct contradiction to the spirit of the Act, as well as, in my opinion, to the wording of it, and also to the intentions of the legislature in passing it. Of course if such a decision is allowed to stand the Act would be rendered entirely void, and it is to be hoped that Scotch Magistrates will speedily return to the interpretation put upon the Act by English Magistrates.

Serious hindrances have been produced in the working of the Act by the steps which the Inland Revenue Chemists have taken. First among the mistakes they have made I ought probably to notice the quantity of salt they are passing as permissible in beer. It is interesting and I must say sad to note that the very same officials who some few years ago examined a large number of samples of beer (which it should be noted were not purchased direct from the brewers, but from the retailers throughout the whole kingdom), and who then agreed to a maximum of 50 grains per gallon as being the utmost which it was necessary to allow, have recently signed a certificate and added to it a gratuitous statement that 68 grains is sometimes found in genuine ales. It certainly needs very serious consideration whether these Chemists, acting as they do as a kind of Appeal Court on purely chemical matters, should be allowed to make any addendum of any kind to their certificate. On the first appearance of the thing it certainly seems wiser that they should be compelled to state the facts only, leaving others who are perhaps better qualified than themselves to draw inferences from the facts. There is another class of cases in which their proceedings have repeatedly rendered prosecutions abortive, viz., that in analysing samples of decomposed milk, they have in many cases made an unknown, and, as far as I am aware, uncertain allowance for decomposition. Now although decomposition may doubtless require to be taken into account in the case of the analysis of very stale milk, it is perfectly clear that when any correction is made for the decomposition, that correction should be stated on the face of the certificate in such a way as to allow evidence to be taken to either confirm or disprove the accuracy of the data used. It appears to me that this defect is due to a bad feature in the system. It is customary among chemists, as among other professional men, to publish every new discovery or improvement which they may make in processes of analysis, medicine or surgery, in order that it may be fairly criticised and examined by those who are free from the bias which inevitably attaches to an inventor, and the weak points, if any, of the process or of the discovery are fairly pointed out. I think it is clear that this criticism not only tends to improve the process itself but gives information to all other workers in the same field. As regards the Inland Revenue Chemists, however, this rule has not been adhered to. The first time their peculiar process for the analysis of butter was ever allowed to be known outside the walls of their laboratory was when it was extracted in examination in Southwark Police Court, and, as far as I am aware, no publication of any kind has taken place in reference to the data on which they work for the analysis of stale or slightly decomposed milk. The consequence is that their processes, not being published, and not being open to public criticism, cannot possibly command confidence.

This is not as it should be; both parties to the controversy lose by such a state of things. Public Analysts lose the benefit of the experience and work of the Inland Revenue Chemists,—and differ as much as we may from them we must certainly admit that they can do some good work—while on the other hand the Inland Revenue employés lose the benefit of that criticism which is the only true means of fairly judging the value of work. When they were first appointed under the Sale of Food and Drugs' Act to act as referees in disputed cases they took what was perhaps under the circumstances a right and proper view of their position—they considered that they were appointed by the Legislature virtually to act as defenders of tradesmen in all cases in which they could be fairly and honestly defended; in other words their standpoint was to some extent opposite to that of the Public Analyst. Under the Act it is unquestionably the duty of the Public Analyst to endeavour to defend the consumers of food, drink, and drugs from imposture or fraud, and they being so protected, the Inland Revenue Chemists were not required as far as the general public was concerned, but the traders complained that in some cases too much heed was given to grievances which were only imaginary and not real on the part of the consumers, and consequently the Inland Revenue Chemists were appointed to protect the vendors. This necessary, although somewhat unfortunate conflict of interests has been perhaps, to a great degree, the cause of the discrepancies which, upon two or three occasions, have been shown by the results obtained by the different chemists.

Passing from this on to another subject, I may note that during the year a Limited Liability Company called the Institute of Chemistry, has been formed, and has duly received a license from the Board of Trade. The object of the Institute, as put forward by its promoters, is to discriminate between competent and incompetent chemists. The matter has been often referred to at our meetings, and especially in the discussion which took place recently on the desirability of changing the name of this Society, so that I need say little more in reference to it, except that the new Institute is—like our own Society—entirely a voluntary association of members, and that it has no power to confer degrees or diplomas of any kind. Our Society being essentially a working society,—that is, one for the reading of papers on practical subjects, which scarcely enters into the programme of the Institute—there is ample scope for both Societies.

As regards ourselves during the past year we have prospered fairly well, considering the influences which have been brought to bear against us. Tradesmen, until recently, have been in the habit of denouncing not only the members of this Society, but all analysts, as impertinent intermeddlers, and it has been uncommon to see an analyst's name without the prefix "incompetent," but now times have changed, and even the trade journal of the grocers acknowledges that "adulteration is rampant." If any proof were needed that there is plenty of work for the members of this Society to do, this statement supplies it. As public officers, analysts must dismiss every personal question, and simply do their duty as laid down by the law, and suppress adulteration in whatever form, or in whatever quarter it may exist.

There is one point on which I think analysts err, and that is in appearing in court as witnesses for the defence—there seem to me to be very few cases in which a public analyst holding as he does a government appointment, should appear as a witness for the defence in a case where the certificate of another public analyst is in question. The law has already provided a tribunal to which appeal can be made, and though this tribunal

has not up to the present erred on the side of too great stringency in prosecutions, yet it is amply sufficient for the purpose. No Excise officer would be allowed to appear for the defence in Excise prosecutions, and similarly it appears to me that no public analyst should be allowed to appear as a witness for the defence in a prosecution under the Sale of Food Act.

Our Society during the year has increased slightly in numbers, though of course we have lost a few members by withdrawal, and one, Professor Apjohn, by death. Seven new members have been elected in addition to the four we have elected this evening. In looking at the figures we must bear in mind how small is the constituency from which we can at present draw our members; there are probably less than 200 men in England who are eligible to become Members of the Society of Public Analysts under the present constitution, and we have now a tolerably good percentage of these as members. Under the present constitution however, the income which the subscriptions from the present members brings in is barely sufficient for our needs. A journal like *The Analyst*,—which publishes from month to month probably more original papers on strictly analytical work than any other periodical except the Journal of the Chemical Society, 22 papers having been read last year before this Society, and published in *The Analyst*, while 11 more papers were published which were not read before the Society, or a total of 33 in all,—cannot be conducted without considerable expense, and we have to pay those gentlemen who have so kindly undertaken the responsibility of conducting it, for the expenses they incur in publishing our proceedings, but even this payment has been very little more than half the cost which was incurred by the Society during the year when *The Analyst* was published at the cost of the Society itself. In order to meet this cost and possibly enable *The Analyst* to be enlarged, and to do what no other similar journal does, viz., report the papers read at these meetings closely up to date, we shall need more money. The Council have had this matter under their serious consideration, and although they have come to the conclusion that it would be a great mistake to alter in any way the real limits laid down by the constitution, as defining those who should be eligible for membership of this Society, viz. analysts in practice, they are considering whether assistants, who have been in salaried employment for not less than two years after the expiration of their term of; pupilage, may not fairly be classed as analysts in practice within the meaning of the rules the difference between them and the present members being simply that their fees are received in the shape of a fixed salary and not as a certain sum per sample.

If this should be done I think the Society might fairly expect a fresh access of members, whose subscriptions would bring the balance of the accounts on to the right side. This alteration would give to a class of men, who, by the mere fact of their receiving for a term of years definite salaries for pure chemical work, are proved to be qualified, the opportunity of joining our Society, and although we cannot and do not desire to grant a diploma, yet the fact of membership will, we think, be considered by the public as some kind of guarantee that a man has a certain status in the chemical world.

The Session of Parliament which opens to-morrow seems likely to prove a busy one on analytical matters, for legislation on more than one point appears imminent. The question of impure drugs is to be raised, and probably following the abortive bill, which was introducued towards the close of last session, Parliament will again be asked to

decide on a fixed strength for spirits. Water and gas are also likely to come forward again as prominent questions, and on all these and any other points of chemical legislation, the Society of Public Analysts ought to have something to say, and that, I think, is another strong reason why we should have a little more money.

One word more,—we as a Society ought certainly to try to suppress the practice of underbidding, and of advertising certificates of milk analyses at 2s. 6d., and water analyses at 7s. 6d.; I have seen advertised in many a grocer's shop certificates of the purity of nearly everything in the place. All this should be done away with. I am quite sure that the low fees cannot pay for honest work, and that no fees, however high, can pay for risking a reputation made by years of work and study in certifying to the purity of the goods which other people sell.

A ballot was then taken for the election of Officers and Council for the present year, and for new members proposed for election. Messrs. Adams and Slater were appointed scrutineers to examine the voting papers, and they reported that the following had been elected :—

President.

A. Dupré, Ph.D., F.R.S., F.C.S.

Vice-Presidents.

A. H. Allen, F.C.S.
A. H. Church, M.A., F.C.S.
J. Muter, Ph.D., M.A., F.C.S.

Treasurer.

C. W. Heaton, F.C.S.

Hon. Secretaries.

Charles Heisch, F.C.S.
G. W. Wigner, F.C.S.

Other Members of Council.

J. C. Brown, D.Sc., F.C.S.
C. A. Cameron, M.D.
W. H. Corfield, M.D., F.C.S.
J. Falconer King.
H. C. Bartlett, Ph.D., F.C.S.
J. W. Tripe, M.D.

Those Members of Council whose term of office has not expired, and who consequently do not retire this year, are Messrs.

A. Wynter Blyth, M.R.C.S., F.C.S.
John Clark, Ph.D.
Alfred Hill, M.D., F.C.S.
E. W. T. Jones, F.C.S.
W. W. Stoddart, F.C.S.

The scrutineers also reported that Messrs. J. H. Martin, J. W. Gatehouse, J. Whitle, and A. A. Nesbit had been elected members of the Society, and Messrs. F. W. Gear and W. J. Williams as associates.

Dr. Dupré proposed, Mr. Wigner seconded, and it was unanimously resolved that the President of the Chemical Society, Dr. Gladstone, F.R.S., be in accordance with precedent, elected an honorary member of the Society, and that the late President F. A. Abel, C.B., F.R.S. be re-elected as an honorary member, his official term having expired, and they were accordingly elected.

Dr. H. W. Hake was proposed as a member, and will be ballotted for at the next meeting.

A discussion took place as to the analyses made at Somerset House, and Mr. Wigner said that considering the unsatisfactory character of the decision in those cases in which appeal is made t[illegible] set F[illegible] nt only because there was often a difference between the Somer[illegible] nselves, but because they did

not know on what basis the Somerset House Chemists were working, he should propose that the Society pass a resolution directing the secretaries to address a letter to the principal of the Somerset House Laboratory, asking him to read a paper at the Society's next meeting, or at a special meeting to be called for the purpose, to lay definitely before the Society the bases on which they work as regards milk and other things, pointing out their reasons for differing from the Society's standard, and the modes of procedure which they adopt.

Dr. Muter seconded the proposal, saying that at present they were all working in the dark as regards the views of the Inland Revenue Chemists.

Dr. Bartlett supported the proposal and said he thought it would be most desirable if they could get the authorities at Somerset House not only to give them the benefit of their ordinary working methods, but also to forward papers on any matters which could be tested out.

Dr. Dupré cordially agreed in all that had been said, and observed that people soon found out what the standard or the limit of Somerset House was, and they began to adulterate down to that standard, and he thought it would be very desirable if they could induce the Somerset House Chemists to come there, and he did not see if they were met fairly why they should refuse to come.

The resolution was put to the meeting and carried unanimously.

The Secretaries submitted the accounts for the past year, and Auditors were appointed to audit and report on them at the next meeting.

Mr. Wigner gave a short abstract of a note on some samples of Canadian butter, which will be published in our next number.

After the meeting the Anniversary Dinner took place at the "Criterion," Piccadilly, and among the visitors were Dr. Cameron, M.P. for Glasgow, Mr. A. P. Bower, and Mr. Gee.

SOME CONSTITUENTS OF HOPS.

By Emery Gilbert Bissell, Ph.G.

From the American Journal of Pharmacy, December, 1877.

It is pretty generally supposed that lupulin contains all the active principles of the hop. Some doubt in regard to this having been recently expressed, the writer has endeavoured to settle the question, with what success may be judged from the following experiments. The best of hops were selected, those as nearly ripe as could be found during picking; from these the bracts were carefully removed; the ends next to the achenes, to which part of the bracts most of the lupulin adheres, were trimmed off with scissors; the remainder of each bract was then passed between the thumb and finger to remove the remaining particles of lupulin, a magnifying glass being used from time to time to see that the work was thoroughly accomplished. This process is a difficult and tedious one, the lupulin adhering to the bracts with considerable tenacity. The bracts were then allowed to dry, without the aid of artificial heat, and were found to shrink about three-fourths in weight; after much perseverance one troy ounce of the dried bracts was obtained. Some difficulty was next experienced in powdering them; rubbing them with sand in a mortar was first tried, and found to be exceedingly slow work; grinding in a drug mill was next attempted, but found to be simply impossible; the method finally resorted to, and found to work nicely, was to cut the bracts in pieces with

shears. This may readily be done by grasping the hand full of them and passing the shears repeatedly through many of them at once, sifting out the fine particles from time to time. The powder thus obtained was exhausted with stronger alcohol, and a tincture obtained possessing a bitter taste and some odour, neither of which would, however, hardly remind one of hops. The alcohol was distilled off from the tincture, and an extract obtained weighing seventy grains. To the distillate was added some water, the alcohol distilled off at a gentle heat, and the heat then raised. The distilled water was observed to have a slight foreign odour, but could not be recognized as the odour of hops; it had no effect on litmus paper, and produced no change in colour with a solution of permanganate of potassa, evidently containing not more than the merest trace of volatile organic matter.

Of the extract obtained twenty grains was reserved for further experiment, the remaining fifty grains being tried in the following manner:—One half of it was given to a healthy person; no effect being experienced, in one hour the remainder was given; no effect whatever was noticed upon either pulse, temperature or respiration. The portion reserved was dried by means of the water-bath until it ceased to lose weight, after which the weight was found to be 1·013 gram; of this, ·225 gram, or about 22 per cent., was insoluble in water; the portion soluble in water was found to give the reactions characteristic of tannin, and also to contain a small amount of bitter extractive. The amount of the extract reserved was, however, too small to admit of many experiments.

I then endeavoured to determine the nature of the tannin contained in hops, 700 grains of which were exhausted with boiling water, the decoction evaporated nearly to extractive consistence, and treated with alcohol to remove the gummy matter. The alcohol was evaporated and the residue dissolved in water; the percentage of tannin was then estimated by means of a standardized solution of gelatine containing alum; only about 6 per cent. of tannin could be found. The remainder of the solution was then precipitated with neutral acetate and with subacetate of lead; the two precipitates had much the same appearance, and both were soluble in acetic acid. They were each thoroughly washed, then suspended in water, and decomposed with sulphuretted hydrogen. The filtrate from each was found to contain the tannin, which gave a blackish-green colour with ferric chloride, and precipitated a solution of gelatine containing alum. The two solutions were mixed and the tannin precipitated with an excess of common salt, from which an unsuccessful attempt was made to entirely free it.

For the final experiment six ounces of hops were taken and exhausted with boiling water; the decoction was concentrated, treated with alcohol, filtered, the alcohol evaporated off, the residue dissolved in water, and the percentage of tannin estimated as before; only a little more than five-tenths per cent. being found. The solution, being acid to test paper, was carefully neutralized with ammonia and precipitated with neutral acetate of lead, a bright yellow precipitate being obtained; the filtrate gave no reaction with subacetate of lead and contained no tannin. The precipitate was thoroughly washed, suspended in water, decomposed with sulphuretted hydrogen, the precipitate washed until the washings gave no colour with ferric chloride, and the filtrate evaporated to a small bulk, and shaken with ether in hopes that the tannin might be dissolved; the ether, however, failed to take up any of the tannin, and portions of the solution were therefore treated with the following re-agents:—Tarter emetic, which produced a nearly

white precipitate on standing; ferrous sulphate, no effect; sulphuric and hydrochloric acid at once produced precipitates; protochloride of tin, no effect; sulphate of copper, no effect; solution of potassa gave a dark reddish-brown colour, but no precipitate; gelatin gave a precipitate on standing. The green-black precipitate with ferric chloride certainly indicates that this is not gallotannic acid, which in other respects it resembles, and the reaction with the mineral acids would seem to show with equal certainty that the tannin is not moritannic acid, which it is stated by Wagner to resemble.

NOTE ON A METHOD OF VALUATION OF THE RELATIVE IMPURITIES OF DRINKING WATERS.

By G. W. Wigner, F.C.S.

I have been engaged for some time past in the preparation of a numerical scale so as to enable an approximate estimate to be made of the amount of impurity represented by *every figure* in a water analysis. I have been experimenting on this scale as applied to some 200 analyses of water which have been made for and published in the *Sanitary Record*, and I hope to bring the subject before the Society of Public Analysts at their next meeting. The point which I am seeking to bring out is, that certain definite allowances should be made for the nitrogen in every other form of combination as well as in that of albuminoid ammonia, and that the salt, loss on ignition, oxygen absorbed and microscopical results should also each be credited with a certain value.

PUBLIC ANALYSTS' WORK DURING 1877.

The Local Government Board have issued to all local authorities, circulars referring to the Quarterly Reports made by Public Analysts under the Sale of Food and Drugs' Act, and enclosed with the circular are forms which the Board desires may be filled up for its information, in order that the Analysts' Reports may be embodied in the Board's Annual Report. It is unnecessary to print the forms here, as we have had several hundreds printed and sent to nearly all Public Analysts in the Kingdom, as we thought it would be very desirable, on account of the length of time which must necessarily elapse before the Board's Report appears, that we should publish in the March number of *The Analyst*, a tabulated statement similar to that which, by the kindness of Public Analysts generally, we were enabled to place before our readers last year. In our letter accompanying the form we point out that the returns for our purpose need not be quite so full as those the Local Government Board require, as we only want details of each adulterated sample, while the Board require details of every sample—adulterated or genuine. We trust that Public Analysts will endeavour, as far as possible, to follow the form sent by the Board, so that after the great trouble it has taken on the question, the Board may soon be enabled to put its valuable Report in the possession of the public, and allow them to be the judges, from the work done, as to the desirability of permitting such conduct as that of the Faversham and Dover Justices, in refusing to appoint analysts.

If any Public Analysts, whether belonging to the Society or not, have not received copies of the form of Report and will communicate with us, we shall be happy to send some, and we shall be glad if all analysts would let us have their forms filled up by at latest the 21st of next month.

LAW REPORTS.

GLASGOW CREAM.

In the Justiciary Appeal Court, Edinburgh recently, an important decision was given in an alleged adulteration of cream case. In April last, Mr. Walker, an inspector connected with the Sanitary Department in Glasgow, purchased from James Davidson, milk dealer, 36, Norfolk Street, Glasgow, sixpence worth of cream, which, he stated, was for the purpose of analysis. The sale was made by Davidson's wife. Thereafter, Kenneth M'Kenzie M'Leod, inspector of nuisances in Glasgow, and who was appointed by the Police Board to enforce the Sale of Food and Drugs' Act, 1875, presented a complaint to the sheriff, in which he stated that the article supplied to Walker "was not of the nature, substance, and quality demanded." Davidson pleaded not guilty, but the sheriff-substitute (Lees) held that the charge had been proved, and imposed a fine of £2. It was stated that the cream contained, besides fatty matter, a considerable proportion—more than 50 per cent.—of the other ingredients of milk; that within certain limits, genuine cream varies in richness or percentage of fat; and that the quantity of cream sent up from milk depends on the period during which the milk is allowed to stand or settle, and also upon the disposition of the cows and the nature of their food. In convicting the appellant, the sheriff held, in fact, that the article sold on this occasion, whether or not it contained the various ingredients from which a certain quantity of cream might be formed, was not as a whole, of the nature, substance, and quality of the article known as cream; and in law (1) that where, as here, the purchase was made under the 13th section of the Act, it was not necessary in order to justify a conviction that the sale should be to the pecuniary prejudice of the purchaser, but only that the article sold should not be of the nature, substance, and quality of the article demanded, and of an inferior nature, substance, or quality; that in the event of there being any special circumstances—temporary or permanent—in the nature of the cow, owing to which its milk was unfit to yield cream, except of an inferior quality, the seller was not entitled to sell such an inferior product as cream, if, in truth, it was not of the nature, substance, and quality of cream; (3) that the mere presence in milk of the various ingredients from which cream is formed, and had been to some extent formed, did not justify a dairyman, even though he had done nothing to impoverish the milk, in selling the compound as cream any more than in selling new milk as cream; and (4) that the non-adulteration of the article sold, or the premature period at which it might have been taken from the milk, though they might explain the result and mitigate the penalty, could not, to any extent, relieve the seller of the responsibility imposed on him by the statute.

Davidson appealed to this court against the conviction, and the questions put to the court by the appellant were—whether the sale of the cream was to the prejudice of the purchaser, as stated in the complaint; seeing that genuine cream varies in quality, whether the law has fixed a minimum percentage of fat for cream, and settled that any combination of milk and fat containing less than that percentage shall not be held to be cream, so that a magistrate may convict a party of a contravention of the section of the statute founded on in this case, who sells as cream an article with less than that percentage of fat; whether the city analyst of Glasgow or any other man is entitled to set up a standard for cream so as to make any party who sells a cream under the standard guilty of a contravention of the section of the statute founded on; and whether the facts of the present case warranted a conviction under the section of the statute founded on. On behalf of the respondents the questions were put—whether in this instance a stated case was a competent proceeding; whether the questions put by the appellant or any of them were questions of law; and whether the finding of the Sheriff-Substitute that the article in question was not cream, or in the words of the statute, "not of the nature, substance, and quality demanded," was one of fact or not, subject to review.

The Lord Justice-Clerk was of opinion that the conviction could not stand. The Sheriff was of opinion, on the construction of the statute, that the offence specified in the 6th section had been committed. While the analysis bore that the cream did not come up to the commercial standard, it also proved quite clearly that no extraneous or foreign substance had been added to it, and the question truly involved in the finding of the Sheriff was this—whether it was enough to constitute a statutory offence under this 6th section, that the article sold was not of the quality demanded. His lordship considered this question of very great moment as regarded the operation of this undoubtedly important statute. It was one thing to legislate for defects in the quality of the article sold, and it was another thing to provide against adulteration by the introduction of foreign substances. If they read this clause as regulating defects in quality, the construction opened so wide a door for the questioning of familiar contracts in commerce, that it was difficult to see what importance could be attached to it. Every new article of ordinary consumption might be said not to be of the quality ordered, and in this way many difficult questions might arise. He was of opinion that the statute intended no such thing. It was intended, like all preceding statutes, to strike only at the introduction of foreign substances into articles of food and consumption; and that he conceived to be a very important element in the consideration of this clause. The 6th clause was intended to apply to the mixture of articles of food or drugs with substances foreign to the thing

itself, but not injurious to health; and the offence consisted in selling to the prejudice of the purchaser any article not of the nature, substance, and quality demanded by him. These were ambiguous words. He read them one way, and the Sheriff read them in another. They might mean, as the Sheriff thought, where the article was deficient in any of the three qualities specified, or where it was deficient in any of them, and it was in this latter sense his Lordship thought the words ought to be read. The evidence on which the Sheriff founded showed that no foreign substance or extraneous matter had been introduced into this commodity. If it were enough that the cream was not up to the commercial standard, then the conviction would stand; but his Lordship was of opinion that this was not sufficient, and he said it would lead to the greatest inconvenience if they were to construe it to mean that if the quality of the article sold in open market was not up to that which was demanded, a general offence had been committed under the clause. On the other point his Lordship said that it must be proved that the article sold was under the 6th section to the prejudice of the purchaser, yet the Sheriff found that this was an offence, although the prejudice had not been proved. This was where the Sheriff had entirely misconstrued the section, and on this ground his Lordship thought that the apppeal must be sustained.

Lords Deas, Young, Mure, and the Lord President arrived at the same result, each stating their opinions at great length.

Lord Adam, with whom Lord Craighill concurred, thought the judgment of the Sheriff should be allowed to stand. A decision of matters of fact was not admittedly subject to review, and the facts being admitted, there was nothing in this case which, as he thought, seemed or suggested that in any of his conclusions the Sheriff had been misled by an error in law.—*Glasgow News.*

SALT IN BEER.

On Wednesday, December 19, at the Thames Police Court, James Scott, landlord of the Wellington beerhouse, St. Leonard's Road, Bromley, was summoned at the instance of the Metropolitan Board of Works for the Poplar district, for selling beer adulterated to the extent of 63 grains of salt to the gallon. Mr. Charles Young, solicitor, appeared for the prosecution on behalf of the Board; Mr. Besley, barrister, for the defendant.

William Harrison, one of the inspectors of nuisances to the Board, said that on Thursday, the 29th ult., he went to the Wellington beerhouse, St. Leonard's Road, Bromley, kept by the defendant, and asked his wife, who was serving behind the bar, for a pint and a half of porter. He was served, and then told the wife that he had purchased it to have it analysed. He also applied for a pint of fourpenny ale, but was told it was thick. A few minutes afterwards the defendant entered the house and went into the cellar, and shortly afterwards his wife served the witness with the liquor applied for. He divided it into three parts, and did the same with it as he had done with the porter.

Mr. William Young, analyst to the Board, said that on the 29th ult., he received a sample of porter and ale from the last witness to be analysed. The certificate produced was his, and he there stated it was adulterated to the extent of 63 grains of salt per gallon. In cross-examination by Mr. Besley, the witness said he had never made any beer, but had seen it made. He did not how much salt there might be in hops. He was not aware of the natural quantity of salt in Burton water. He found that a pot of Truman and Hanbury's strong ale contained 16 grains of salt.

Mr. Charles Heisch, consulting chemist to the Corporation of London, said he found 66 grains of salt to the gallon in the porter, and 70 in the ale. He did not say its presence would be injurious to health. He could not tell the quantity of common salt or the amount of hops used in a gallon of beer.

Laurence Burleigh, head brewer at Truman and Hanbury's, Spitalfields, said he had been in their service over 30 years, and had sole charge of the brewery department. All articles used in the brewery department would come under his personal cognizance. Salt was not bought or used in any shape or form. Saccharine matter was imported, and the duty paid to the Excise. Breweries were always open to inspection. Ale contained hops, saccharine matter, and water. He found some ale of the same brewing as that which had been sold to the defendant. That brewing he superintended. There was no salt put into it, and he did not dare to use bad water. Saccharine matter was not used in ale to the extent it was in porter. No salt whatever came on the premises for brewing purposes. In reply to Mr. Young, the witness said the firm used Hartley's deep-well water and the East London water. He had heard that, on some water they had used being analysed, three and a half grains of salt to the gallon had been detected. In answer to the magistrate the witness said he had heard country brewers used salt to some extent, but London brewers did not. If it were used to a large extent, it would spoil the beer. The quantity of malt they used was rather more than one half, the other half was saccharine matter.

Mr. Dugald Campbell, an analyst, said he was well acquainted with the ingredients used in brewing beers, and he was surprised at not more than 63 grains of salt being found in the samples referred to. The salt was attributable to the hops, malt, and saccharine matter. Dr. Henry C. Bartlett gave similar evidence.

John Scott, the defendant, was then sworn, and said he did not put a particle of salt in the beer.

Mr. De Rutzen said that before he decided the case he wished to see the invoice delivered with the beer to the defendant. He adjourned the case for two weeks.—*Times.*

At the adjourned hearing on the 31st December, Mr. Young submitted that the sale came within the meaning of the Act, and that there was no warranty delivered with the articles, but simply an invoice such as could not be sued upon at common law. The magistrate remarked that there must be a written warranty.

Mr. Young said that according to the Act the warranty must state that the goods delivered were of "the nature, quality, and substance" demanded by the purchaser, but what was sent with the goods in this case was a mere invoice, and not a warranty to prove that the goods were unadulterated.

Dr. Auguste Dupré, examined by Mr Young, said he was Lecturer on Chemistry at Westminster Hospital, Fellow of the Royal Society, President of the Society of Public Analysts, and Chemical Referee to the Medical Department of the Local Government Board. He had analysed beer, porter, and ale, and had an opportunity of seeing hundreds of different analyses made, with the special object of estimating the amount of salt contained in them. He should say that 63 grains of salt in a gallon of beer or porter was an excessive amount, such as could not possibly be derived from the malt, hops, and water employed. In a gallon of beer or porter the quantity of salt would be from 5 to 15 grains, and no more. Burton strong ale contains from 16 to 18 grains.

Cross-examined, the witness said, if anyone swore that there was no salt put into the beer manufactured in the ordinary way, witness would not believe him, if he found 63 grains of salt per gallon in it. He should think the other person had made a mistake. When the law prohibited the use of salt in beer, the Excise Department (under his recommendation) would not allow proceedings to be taken for anything under 50 grains. After some further evidence had been given for the defendant, Dr. Bartlett being re-called,

Mr. De Rutzen said:—One thing in this case is quite clear, and that is that the defendant did not adulterate this beer after he received it from the brewers. That is proved from what he himself said in the witness-box, and it is corroborated by Messrs. Truman & Hanbury, who bring forward their own scientific witnesses to say that the beer had not been adulterated by the defendant, for they not only agree with the public analyst as regards the quantity of salt he gives as the result of his analyses, but they go further and say that if he had been a little more careful he would have found it contained a still greater proportion of salt than he did. That is how the matter stands with respect to the defendant. Now, then, comes this invoice, which is put in by Mr. Besley as a warranty. I confess I have some difficulty in saying that this is a warranty; but, as it seems to me, it is quite sufficient of itself to lead the beer-seller who buys this beer to believe that, when he orders single X, double X, treble X, stout, or whatever it may be, and sells it to his customers in exactly the same state as he receives it, he is committing no offence. I have listened throughout this case to hear what exactly is the nature, quality, and substance of beer, as a general rule. I have heard over and over again that it is made from malt, hops, saccharine matter, and water, and I must say I have never heard such an amount of contradictory evidence as that which has been given in this case as to the quantity of salt that should be found in beer made from these articles. Taking the whole of the facts into consideration, I think I must dismiss this summons. Whether salt has or has not been introduced into this beer over and above what may be considered the natural quantity, I am not called upon to determine. I shall hold that this invoice is a sufficient warranty under the circumstances, and that the beer having been sold with this warranty, the defendant is absolved under section 25 of the Act, and therefore the summons must be dismissed. The only other question which remains for me is whether the prosecutor is not entitled to his costs. I shall certainly have to allow them if the defendant relies upon the warranty, unless he has given the prosecution notice of such intention. After some discussion the summons was dismissed, and ten guineas were allowed for the prosecutor's costs.

Adulteration of Seeds.—Thomas Strangeways, Seed Merchant in Mile End, was summoned before the Lord Mayor for an infringement of the Adulteration of Seeds Act, 1869, in having, with intent to defraud, sold killed seeds, or seeds in which the vitality or germinating power had been destroyed by artificial means. Mr. Besley, barrister, conducted the prosecution; Mr. Walter Beard, solicitor, appeared for the defence. Mr. Besley, in opening the case, said this was a very important matter, as it was the first instance in which the Act of Parliament had been put in operation. The Act recited that to "kill" seeds meant to destroy their vitality; and that every person, with intent to defraud, who sold killed seeds, would be duly punished. By the Act, killing or dyeing seeds was prohibited, as was also the sale of such seeds, and for the first offence the penalty imposed was not to exceed £5, and for the second or any subsequent offence £50 or under. The proceedings under the Act must be taken within twenty-one days. The defendant was well known as a practitioner in this kind of business, and had been heard to say that he could snap his fingers at the Act of Parliament. The killing of seed was done by steaming, and then drying on the kiln. The case was brought at the instance of the same gentlemen who promoted the Act of Parliament, and it was most desirable that such nefarious practices should be repressed. Mr. A. Francis said that on October 22nd, he saw W. Chapman, who produced a sample bag containing killed charlock seed. It bore marks in defendant's handwriting. He offered seven sacks at 6s. 6d. per bushel. He (witness) took away a small quantity. Eventually he agreed to take the seven sacks. Afterwards he saw Strangeways, who produced an invoice, but there was no name on it. Defendant said the seed would not grow—not a seed of it; if it did he said he would put it on the kiln again for nothing. He further added

that in consequence of the law he could not put anything into writing. He gave up the sample bag produced by Chapman. He also produced a sample bag of 6½qrs. of the same kind of seed—another lot. He said he had killed this for a party in the country, who had refused to accept delivery because bulk was not equal to sample. He did not want to fall out with the party, who was a good customer, and he wanted to sell it to some one else. The seed would do well for "mixing" purposes. Witness made another appointment about the matter, which he broke. Afterwards he paid defendant £9 10s. in gold for the seed bought. Mr. J. C. Ostler, of Walthamstow, proved having taken a sample of the seed in question to Mr. Sharpe. Mr. C. Sharpe, Seed Merchant, of Sleaford, said with Mr. Burnell he was one of the promoters of the Act of Parliament. Charlock seed was worth from 3s. 6d. to 4s. a bushel. Its *boná fide* use was to crush it for oil, and for the purposes of manure. When charlock was killed it was not fit for crushing. It had no commercial or agricultural purpose when it was killed. Killed seed had no value whatever, and was only sold for mixing with seed of a higher value. If the seed were not killed it would grow and betray the fraud. He had proved that in this case the seeds were killed. Mr. Beard said Mr. Besley need not call further evidence. He could not deny that defendant had sold the seed. With regard to intent to defraud, he urged that Francis was not defrauded, inasmuch as he knew the seed was killed, and did not intend to sell it again ; fraud would not therefore be perpetrated on anyone else. The Lord Mayor : In my mind the case is fully made out. I inflict the full penalty. It is a very serious matter. We pray for a good harvest, and such men prevent us from having it. I shall allow £5 5s. costs. The penalty in all was £5 for the offence of killing the seed, £5 for selling the killed seed, and £5 5s. costs.

At Hammersmith, Robert Edwards, dairyman, of the Mall, Kensington, appeared to answer an adjourned summons, at the instance of the Kensington Vestry, for selling milk adulterated with water. There was another summons taken out against Mary Sheen, of St. Clement's Road, Notting Hill. Both had been adjourned in order that analyses of the samples might be made at Somerset House, the defendants being dissatisfied with the certificates of the Vestry's Analyst. Mr. Harding, clerk of the Vestry, supported the summonses ; Mr. Ricketts appeared for the defendant Edwards. The certificate of Mr. Cleaver, the Vestry's Analyst, stated that the sample of milk in the case of Edwards contained 8 per cent. of added water. The certificates of the analysts at Somerset House stated that the milk contained not less than 4 per cent. of added water. In the other case the certificate of Mr. Cleaver stated that the milk contained 15 per cent. of added water, but the one sent from Somerset House certified that the adulteration was 7 per cent. only. Mr. Harding said the difference arose in consequence of the analysts at Somerset House taking a lower standard for solids than that of the analysts of the metropolis. Mr. Bridge remarked that the difficulty which he saw was owing to the words in the Somerset House certificate, which stated that the fat was equal to that found in milk of good quality. Looking at the opinion of the analysts a jury might say there was not any added water. Mr. Hardy said it was an important question for the public. If the standard were allowed to pass, all the dairymen in the metropolis would adulterate their milk up to a certain amount. The analysts at Somerset House took the standard of milk from a poor cow. Mr. Bridge agreed that mixing water with milk was a serious matter, but the question he had to consider was, whether water had been added to the milk. He adjourned the summons to consider his decision.—*Times*.

At Greenwich police court, a grocer was charged with selling butter adulterated with 66 per cent. of foreign fats. The defendant was represented by Mr. Carttar, solicitor, who, without objecting to the statement of the analysis itself, raised a technical objection, that the certificate was insufficient, inasmuch as it did not state the weight of the sample when received by the analyst. After some argument the case was adjourned for the attendance of the analyst. On the adjourned hearing, after the analyst had given his evidence, and a long argument on the part of Mr. Carttar, the magistrate, Mr. Slade, decided that it was necessary to insert the weight of the sample in the certificate, and in this case, as it was the first decision on the point, he allowed the amendment to be made in Court, and convicted the defendant, who was fined 10s. and costs.

A Disputed Analysis.—At the Bromsgrove Police Court, before Sir Richard Harington and Mr. Robert Smallwood, Thomas Fisher, of Worcester Street, was summoned on a charge of adulterating milk. Mr. Buller, of Birmingham, represented the defendant.—Superintendent Tyler proved that he purchased a pint of new milk from defendant, divided and sealed it, gave one part to the defendant, and sent another part to the County Analyst. Dr. Swete, County Analyst, was examined, and produced a certificate of his analysis, which showed that the milk contained—total solids, 12·98; fat, 1·76; ash, ·70. *This gave a total of solids not fat*, 11·22. He considered that new milk ought to contain more than 3 per cent. of fat, and no cow in health could give as small an amount as found in the sample. Mr. Buller, for the defence, submitted that the summons was taken out under the wrong section of the Act of Parliament, and argued that the milk was not sold "to the prejudice of the purchaser." It should have been taken out under the 9th section, which provided against the abstraction from the article sold, or any part of it. With respect to the analysis, he considered it imperfect, and hardly reliable. It was important to consider what time the milk was taken from the cow, as it had been stated that constant dipping in the can caused a diminution of one-third of the cream when the vessel was half empty. He contended that the milk was sold exactly as it was taken from the cow.

The defendant was called, and proved that he milked the cows himself, and the milk had not been out of his sight when he sold complainant the sample produced. Dr. Alfred Bostock Hill, analyst for the county of Warwick, was examined, and stated that he had analysed the sample of milk sent to him by defendant, and found it contained 9·22 solids not fat, 3·47 fat, and ·69 ash. Total solids, 12·69. He agreed as nearly as possible with Dr. Swete as to the quantity of solids. If the sample had been sent to him in his official capacity he should have pronounced it a perfectly genuine milk. In cross-examination he admitted that the sample was badly sealed, although the seal had not been tampered with, and it was impressed similar to the other samples. The Bench thought it possible the contents might have been tampered with by an interested person, and taking into consideration the discrepancies in the opinions of the analysts, they thought the best course was to send the remaining sample, under the care of Col. Carmichael, to Somerset House, for analysis by the Government authorities. The case was adjourned until the 13th February.—*Birmingham Daily Gazette.*

Alleged Milk Adulteration.—At the Stonehouse Police Court recently, John Luscombe, dairyman, Martin Street, Plymouth, was summoned before Major Trist and Mr. W. E. Matthews, on a charge of selling adulterated milk. Captain Brutton, Superintendent of Police, stated that on the 19th inst. he saw the defendant with a horse and cart in Union Street, Stonehouse, and purchased a pint and a half of raw milk of him for 3d. He put the milk into three bottles, gave the defendant one, kept one himself, and sent the third to the county analyst, Mr. Wynter Blyth, who certified that 10 per cent. of water had been added, and a small quantity of cream abstracted. The analyst observed that in each hundred parts there were—water, 89·10; caseine, &c., 8·19; ash, ·62; milk fat, 2·09; total solids, 10·9; solids not fat, 8·81. The defendant said that the milk was perfectly pure. Some cows that he had yielded twenty quarts of milk a day, and others did not yield above five quarts a day. The milk of the latter was not so good as that of the former. He added that he was not satisfied with the certificate of the analyst, and wished the milk to be sent to Somerset House to be analysed. The Bench adjourned the case until January 11th, in order that the milk might be sent to Somerset House. On January 11th the case again came on. Mr. R. G. Edmonds appeared for the defendant. Captain Brutton said that the Somerset House analysts—Messrs. J. Bell, R. Bannister, and G. Helm, had reported that in each hundred parts of the sample there were:—solids not fat, 7·84; fat, 3·38; water, 88·78; and ash, 0·68. They also added that the amount of fat was fully equal to the average found in genuine milk of good quality. After making allowance for natural losses arising from the decomposition through keeping, the amount of solids not fat was lower than was found in genuine milk of low quality. From the consideration of these results they were of opinion that the milk could not be pronounced deficient in cream, but that it contained not less than 5 per cent. of added water. Mr. Edmonds, on behalf of the defendant, contended that as there were such discrepancies between the report of Mr. Wynter Blyth and the report of the Somerset House analysts, his client was entitled to an acquittal. The Bench said that as there were such discrepancies between the two reports of the analysts, they had decided not to convict the defendant.

John Taverner, dairyman, King Street, Plymouth, was summoned for refusing to supply Capt. Brutton with milk. Capt. Brutton stated that on the 19th ult., he saw the defendant with his cart in East Street, and told him that he required some milk. The defendant replied that he had none for sale, and commenced to drive off. Witness told him that he was bound to supply him with some, as he was the inspector, and the defendant again replied that he had none, and drove away. He was prepared to prove that the defendant, after leaving East Street, went into a shop and offered some milk for sale. Mr. Square, who appeared on behalf of the defendant, remarked that the section under which the defendant was summoned was to the effect that if any officer, inspector, or constable should apply to purchase any article of food, or any drug, exposed for sale by retail, he should tender the price for the quantity he required. This Captain Brutton did not do, and consequently the case must fall through. The Bench dismissed the summons.—*Western Morning News.*

The Gaslight and Coke Company (Limited), Horseferry Road, Westminster, was summoned before Mr. Bushby for having, on the 11th ult., supplied gas of a less illuminating power than allowed by the Act of Parliament. Mr. Fry appeared on behalf of the Metropolitan Board of Works, the complainants; Mr. Bedford for the company. Mr. Fry stated that on the 11th ult. the gas examiner at the Shoreditch station found that the gas delivered to the public from that station was only of the illuminating power of 14 candles 7-10ths, the *minimum* allowed by the Act being 16 candles, rather more than one candle deficient. The penalty for this default, computed in accordance with the words of the 50th section, amounted to £74, and the proceedings were taken to obtain a warrant for the recovery of that amount. Mr. Bedford, though not complaining of the act of the Board of Works as guardians of the public rights, said that, on behalf of the company, he wished it to be known that so far from this being at all usual there had been no complaints before. He produced certificates of the gas examiners for all the months of 1877, showing that the average illuminating power of the gas supplied during the year was 17·61, or more than a candle and a half in excess of that required. Mr. Bushby said his duty was merely executory, and the warrant for the payment of the £74 would issue.—*Times.*

ANALYSTS' REPORTS.

The report of Mr. J. Carter Bell, analyst for Salford, was submitted to a Meeting of the Town Council. It showed that during the past quarter he had examined 127 samples; of these forty six were adulterated, viz., eight of bread, one of flour, nine of milk, three of tea, four of whisky, nine of gin, four of port, four of sherry, and four of claret. In twelve of these cases summonses were taken out, and convictions obtained.

At Somerset Quarter Sessions, Mr. W. W. Stoddart, county analyst, reported that during the last quarter he had analysed 249 samples, of which 211 were good commercial articles; three were received from the public, and 246 from police superintendents. The Chairman announced that the appointment of Mr. Stoddart, which was for two years, had expired. A discussion took place relative to his re-appointment. In answer to the chairman the chief constable stated that analyses in the county were considerably on the decrease, and the duties of the analyst were not so heavy. Ultimately Mr. Stoddart was re-appointed for a year.

Dr. Brown, analyst for Liverpool, at a meeting of the Water Committee of the Town Council on Tuesday, reported that, by an increased supply of Rivington water to the Kensington district, a larger proportion of soft water was given to that district, and this affected a decrease in the waste of soap, which amounted, on a very low estimate, to at least £3,000 per annum for every 100,000 inhabitants.

Laboratory Vintage.—The chemists of Berlin have been occupied lately in analysing the wares of the wine merchants, and no little excitement has been caused by the discovery that the entire stock of one of the largest houses dealing in wines for medicinal purposes consisted entirely of artificially prepared mixtures of spirit and sugar solutions, flavoured with various herbs.—*Brewers' Guardian.*

Peruvian Wine.—A writer in the *Northampton Mercury* says: "I have discovered why English travellers dislike Peruvian wine. In Mr. William Clarke's work on 'Peru and its Creditors,' to be published next week, I read that in that country the grapes are placed in a circular walled enclosure, into which numbers of oxen are admitted and kept in motion by men armed with whips. I am not surprised that many Englishmen become teetotallers during their stay in the rainless clime."

CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

To the Editor of "The Analyst."

Sir,—Will you allow me to point out that Mr. Young's process for the determination of sulphuric acid in vinegar (Analyst, No. 20) is identical with that described three years ago by Mr. Thresh? (*Pharma. Journ.*, 1875.)

I remain, yours faithfully,

OTTO HEHNER, F.C.S.

To the Editor of "The Analyst."

Sir,—With reference to Mr. Angell's letter in your last issue, permit me to say that in my process for estimating sulphuric acid in vinegar there is an excess of chloride of barium in a neutral solution before estimating the total chloride, and also in estimating the chlorides after ignition, so that it is impossible for alkaline phosphates to be present. Mr. Angell will thus see he has found a mare's nest.

With regard to Mr. Hehner's process, I did not hear of it until after my paper was read, and on looking for The Analyst for August, 1876, I found it in its postal wrapper; it had been delivered at a time when I was away from home on my holidays, was mislaid, and so escaped my notice. The process no doubt answers its purpose admirably as a quantitative method, but the qualitative test is insufficient, as on account of the frequent presence of sulphate of lime in vinegar, many samples which are free from uncombined mineral acids, give a neutral ash, and in such cases it would be necessary to go on with the quantitative process. With regard to the relative value of the two processes, I think most chemists would prefer making two volumetric estimations of chloride to one of alkali, certainly no more time is required. In Mr. Hehner's process it seems you must guess the quantity of mineral acids present before proceeding, and if you should be below the proper amount it is necessary to repeat the experiment until an alkaline ash is obtained, whereas in my process no repetition is needed.

On reading Mr. Hehner's paper my attention was directed to a method devised by Mr. J. C. Thresh, published in the *Pharmaceutical Journal* for 3rd July, 1875, in which I find he has anticipated me. Mr. Thresh's process is shortly as follows:—After ascertaining the amount of chlorides present, a known quantity of a standard solution of chloride of barium is added to the vinegar, the whole evaporated to dryness, burnt, the ash washed out with water, boiled with a slight excess of bicarbonate of soda, filtered, and the chlorides estimated volumetrically in the filtrate; the loss of Cl being calculated as H_2SO_4.

It will be seen that the principle of the process is identical with mine, but differs in detail, and I may state that the use of a *standard* solution of chloride of barium is unnecessary, and that more accurate results are obtained by applying the standard solution of nitrate of silver to the ash *in the presence of the insoluble matter*, and as little water as is necessary to wash the contents of the crucible into a beaker.

I know by repeated experiment that unburnt carbon and sulphate of barium, which has been heated with chloride, will retain considerable quantities of chlorides even after what would be considered excessive washing.

I am, Sir, yours etc.,
W. C. YOUNG.

Plaistow, E.,
11th January, 1878.

Mr. Wynter Blyth, of Barnstaple, reported a sample of milk to be adulterated with water, and on the hearing of the case, a report of which appears on another page, the duplicate sample was referred to the chemists at Somerset House. Mr. Blyth wrote to them, enclosing copies of his duplicate analysis of his portion of the sample in question and requested them to supply him with a copy of their results. The following is a copy of the reply sent to him; it seems to us of sufficient importance to publish it, as showing the views which the Inland Revenue Chemists take with reference to milk standards:—

Laboratory, Somerset House, London, W.C.,
January 3rd, 1878.

Dear Sir,—I duly received your letter of the 28th ult., and you may rest assured that we will do our utmost to arrive at a just conclusion on the Stonehouse appeal.

We operate with weighed quantities, and all our results are determined by weight. We duplicate the experiments, and we are not satisfied if the results differ by more than a tenth of a grain.

The position which we occupy being entirely a neutral one, you will no doubt agree that we could not supply either side with our results, the Magistrates being the only persons with whom we have to deal.

I have seen Mr. Carter Bell's paper on milk, and the result of our experience differs materially from his. If you should be in town and call, I shall be happy to show you the results of the analyses of upwards of 300 samples obtained from various parts of the country. The cows were milked in the presence of an assistant from this laboratory, and we can vouch for the genuineness of the samples.

I am, yours faithfully,
J. BELL.

Dr. Blyth.

Mr. J. West Knights has been appointed Public Analyst for Cambridge, Cambridgeshire, Huntingdonshire, and the Isle of Ely, in the place of Professor Apjohn, deceased.

Mr. James M. Milne, Public Analyst for Kinning Park and Dunfermline, has been appointed Public Analyst for Fifeshire.

Mr. A. Wynter Blyth, Public Analyst for the County of Devon, has been appointed Public Analyst for the Borough of Totnes, on terms similar to those of the county.

Mr. J. Walker Montgomery has been appointed Public Analyst for the County of Cumberland.

The *Grocer* says that last week, for the fourth time, the Town Council of Dover received a letter from the Local Government Board, urging them to appoint a Public Analyst. The Council ordered the receipt of the letter to be acknowledged, but took no action in the matter.

Public Analyst.—The Town Council of Faversham have had under consideration a letter from the Local Goverment Board, calling their attention to the fact that they had not appointed a public analyst for the borough, under section 10 of the Sale of Food and Drugs' Act, and that it was desirable to give effect to the intentions of the Legislature. It was proposed and seconded by Councillors Wyles and Fagg, two grocers, that an analyst should not be appointed. Alderman Johnson pointed out that town councils which evaded Acts of Parliament lost weight and influence, and that the Council would probably be compelled to appoint an analyst if they did not do so voluntarily. Nevertheless, the resolution referred to was carried by seven votes against two.—*Times*.

NOTES OF THE MONTH.

Since the replies given by our Society to Dr. Rottenburgh, on behalf of the German Government, were published in this journal, our amusing friend the *Chemist and Druggist*, has printed a series of replies to the same queries on behalf, as it says, of the victims. Unfortunately we have not space to reproduce them in all their unique entirety; but it is exceedingly flattering to our vanity, as a body of men, that we should have been able to actually produce six answers out of twenty-seven which even the great torpedo of Cannon Street cannot find heart to blow us up about.

The champion of the "victims" does not, however, stop at this negative praise, but it actually says, referring to answer 27, "We thank the Analysts for this reply, especially the last clause of it. We have only to add that an analyst should also possess so much modesty as should enable him to recognize, first, that the science of chemistry is not personified in perfection in his individuality; and, secondly, that he is simply the analyst, and not, in addition, the prosecutor and the judge." Why this is exactly what we have been all along trying to get our friend's grand intellect to grasp. The analyst is not the prosecutor, and consequently not responsible for the action taken by others. Where, then, is the ground for all the diatribes we have read charging analysts as being alone responsible, and entirely to blame for the failure of prosecutions.

To the question as to publication of offender's names (to which our Society answered, "Yes, at the discretion of the court") the victim's friend answers, "Yes, if we can have some guarantee that the court possesses such discretion." What guarantee could ever be had of this, unless we made the judge refer to the *Chemist and Druggist* before ordering publication! Unfortunately for our friend, the Legislature will not go so far, and we hope that he also will possess so much modesty as to be brought to recognize, first, that the whole science of interpreting chemical results, and deciding on disputed standards, "is not personified in perfection in his individuality"; and, secondly, that he is only a trade journalist, and not, in addition, both defendant and judge.

In dealing with answer 23, in which our Society recommends the appointment of a body of referees, each possessing some special knowledge of a particular set of substances from having made a study of, and written about them, instead of the present reference to the Inland Revenue chemists, the victim's friend says,—"There is no reason whatever to imply that the Inland Revenue chemists have been in any degree unfit for their duty, *au contraire*." Doubtless the chemists at Somerset House will fully appreciate the value of this most disinterested compliment, and when we consider the little bit of French thrown in, why they must feel flattered indeed.

On the same principle that the great king of old kept a disagreeable party, who continually reminded him that he was mortal and must soon die, we print the following extract from a paper representing the greatest of the victims, to wit, the public, who buy grease for butter, water for milk, and take daily doses of copper in their pickles and peas, lest the court of reference should begin to fancy themselves immortal.

"The Government analysts at Somerset House—apparently an utterly irresponsible body—have paralysed the action of the public analysts by declaring that as much as 68 grains of salt in ale was legitimate, and that milk might yield only an absurdly low

quantity of solids, and yet not be adulterated. The result will be that standards must be fixed by Act of Parliament, and nobody is more competent to say what they should be than the Society of Public Analysts."—*Echo.*

Mr. Cleaver has been more successful than most analysts in reference to cases of milk adulteration, where the amount of added water is small, for the Somerset House chemists only differ from his results by a very small percentage. It would be interesting to know what Mr. Cleaver's figures were, and what standard of milk adulteration he adopted. We will gladly publish any communication from him on this subject.

We are afraid our worthy President was somewhat too sanguine in his remarks at the anniversary meeting, as to the cessation of personal attacks on analysts, and if anyone thinks that the day for such attacks has gone by, they will be speedily undeceived if they turn to the last number of the *Country Brewers' Gazette*, where, among other things, it is seriously stated that no public analyst is competent to undertake the analysis of beer, in order to determine whether it contains salt, unless he also possesses knowledge of the actual process of brewing beer—in other words, he must serve his apprenticeship as a brewer, and then turn public analyst!

The next meeting of the Society of Public Analysts will take place at Burlington House, Piccadilly, on Wednesday, the 20th February, at 8 o'clock, when Dr. H. W. Hake will be ballotted for, and Mr. H. P. Harris will be proposed, as members; and amongst other papers Mr. Wynter Blyth will read one "On the Fatty metamorphosis of gaseine in Milk and Cheese."

RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
2085	A. Budenberg and F. Hurter ...	Pressure Vacuum and Speed Gauges	8d.
2090	C. H. Gill	Apparatus for Moulding and Pressing Sugar	10d.
2094	A. M. Clark	Electric Light Apparatus	8d.
2105	T. & T. B. Redwood	Manufacture of Gas	4d.
2106	J. H. W. Biggs	Apparatus for Manufacturing Salt and Carbonate of Soda	—
2147	F. Delori	Measuring, Controlling, and Registering Juices of Beet Root, Alcohol, &c.	6d.
2182	J. M. Granville	Thermometers and Spirometers	4d.
2183	M. K. G. Lieber	Manufacture of Soda and Potash	2d.
2249	M. H. Strong	Manufacture of Gas	6d.
2250	B. & W. Foster	Extracting Tannin Matter from Old Scrap, or Waste Leather	4d.
2257	A. C. Collineau & M. E. Savigny ...	Process of Greening Preserved Vegetables	4d.
2327	W. Black and D. Hill	Manufacture of Sulphates of Soda and Potash	6d.
2362	R. W. Wallis and C. F. Claus ...	Purification of Gas, &c.	4d.
2645	J. C. Mewburn	Pressing and Filtering Beet Root Juice, &c.	6d.
2839	P. Jablochkoff	Distributing and Increasing with Atmospheric Electricity Currents from a Single Source of Electricity for supplying Several Lighting Centres	4d.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Medical Record; The Miller; The Anti-Adulteration Review; Journal of Applied Science; The Country Brewers' Gazette.

THE ANALYST.

THE SOCIETY OF PUBLIC ANALYSTS AND THE SOMERSET HOUSE ANALYSTS.

OUR readers will see by the correspondence published on another page that Mr. Bell, the principal of the Inland Revenue Laboratory, has declined to comply with the request of the Society to favour them with a paper on the standards adopted in that Laboratory for the analysis of milk and butter. This seems to us a decision to be greatly regretted, because, if we mistake not, as is pointed out by a correspondent in a letter we publish, Mr. Bell did once give a lecture on the Adulteration of Food before the Chemical Society not many years since. At that time less interest would probably have been taken in the particular standards or methods which may be adopted in disputed cases than is shown now, because adulteration was so prevalent then that a mere question of a few per cent. more or less was of little moment, but now that the methods for detecting adulteration have been so simplified, and the processes so much improved, it is, we think, a matter for great regret that public analysts should not be put into possession of the information which Mr. Bell's own latest report (which we have thought it right to reprint in this number) states that they have found of such great value in dealing with disputed cases of adulteration. As, however, the matter is still under the consideration of the Council of the Society, we will make no further remarks on the subject at present.

SOCIETY OF PUBLIC ANALYSTS.

A GENERAL MEETING was held on 20th February last, at Burlington House, Piccadilly, the President, Dr. Dupré, F.R.S., in the chair.

The minutes of the previous meeting were read and confirmed.

Messrs. Williams and Broadbent were appointed scrutineers to examine the voting papers, and they reported that Dr. H. W. Hake was unanimously elected a Member.

Mr. H. P. Harris, F.C.S., Rotherham, Dr. S. T. Rowe, Redruth, Mr. J. West-Knight, Cambridge, and Dr. H. Goode, Derby, were proposed for election, and will be ballotted for at the next meeting.

The accounts, as audited, were presented, and ordered to be printed.

The letter which had been sent by the Secretaries to Mr. Bell at Somerset House, and the correspondence which had subsequently taken place (all of which will be found on another page) were read, and Mr. Wigner reported that the matter had been considered by the Council, who had decided to take such a course, which he mentioned, as they considered best under the circumstances.

Dr. Muter read a paper "On an Adulteration of Milk which cannot be detected by the ordinary process of Analysis."*

Mr. Wigner read a paper "On the mode of statement of the results of Water Analysis, and the formation of a numerical scale for the valuation of the impurities in Drinking Waters."

Mr. Hehner read a paper "On experiments on the chemical action of Chlorate of Potash on the system."*

A paper by Mr. Wynter Blyth "On the Fatty Metamorphosis of the Albuminoids of Milk and Cheese" was also read.*

The next Meeting of the Society of Public Analysts will take place at Burlington House, on the 20th March, at 8 o'clock, when amongst other papers to be read is one by Mr. Wynter Blyth, "On the Amendment of the Sale of Food and Drugs' Act."

* In consequence of the great pressure on our space this month we are obliged to postpone the publication of these papers till our next number. We especially regret this in the case of Mr. Blyth's paper, which shows that the analysis of stale samples of milk may give results even more illusory than any that have hitherto been suspected.—EDITORS ANALYST.

ON THE MODE OF STATEMENT OF THE RESULTS OF WATER ANALYSIS AND THE FORMATION OF A NUMERICAL SCALE FOR THE VALUATION OF THE IMPURITIES IN DRINKING WATERS.

By G. W. Wigner, F.C.S.,

Read before the Society of Public Analysts, at Burlington House, on February 20th, 1878.

A great deal has been written about the analysis of drinking water, but in my opinion, the ground is by no means entirely covered, and although I am prepared to expect a difference of opinion on some of the points I am about to bring forward, I think it will be admitted that most of them are to some extent at least new. Samples of drinking water come into the hands of analysts, probably in larger numbers than samples of any other article used for food or drink, and yet we find, that while, as regards a sample of milk, or oil cake, or bread, the statement of the results obtained is made by most analysts in a somewhat uniform style, when we come to water, scarcely two analysts will be found who will express the results obtained from the analysis of a given sample, or the deductions from those results in the same way.

One of the earliest attempts to which I need refer at systematizing the methods of water analysis was made in 1865 by Dr. Miller, the then President of the Chemica Society, but his paper went very little further than carefully detailing the systems and the processes to be adopted for the determination of the various constituents which were then usually determined in the process of a full water analysis, and although Dr. Miller unquestionably did good service in some ways by his paper, he was also probably the first to lay the foundation of the objectionable system which has since sprung up of reporting the results of water analyses in foreign instead of English measures. It may be that through his position as one of the Royal Commissioners of weights and measures, Dr. Miller became more deeply imbued with the *supposed* advantages of the foreign metrical system over the English system, but, at any rate, although he did not go so far as to advise that the reports of water analyses should be made entirely in foreign measure, he did advise what it is pretty certain no analyst would ever think of carrying out, viz. :—that duplicate reports should be sent in, one in English weights and measures and the other in the foreign system,—thus duplicating the work of writing the report and turning the analyst into a feeble parody of a popular teacher.

Dr. Miller's suggestions bore their full weight however, and consequently we find that he was followed not long after, first by Frankland and Armstrong, and then by Wanklyn, Chapman, and Smith, who were the next workers in the field of water analysis, and who both adopted, one fully, and the other in part, the metrical system. On this point my opinion is very strongly in favour of the adoption of the English weights and measures only. Water analyses are ordinarily made not for the information of analysts or scientists, but for the guidance of the public, and especially for those members of the public who have in their official capacity to arrange for the water supply of the people. To any of these persons who are of ordinary average intelligence, a gallon is a quantity of which they have to some considerable extent a fairly accurate conception, and I think, that to the majority of them, a drop and a grain would be viewed as very nearly synonymous terms. They have therefore a true mental conception of what are the units of volume and weight, in which the results of the analyses are expressed, and are therefore able to form some idea on their own account of what degree of impurity is indicated by a certain given figure, say for instance, 5 grains of salt per gallon.

On the other hand I have never yet met with an Englishman of ordinary average intelligence who, unless he had given some special attention to the study of science, could form the remotest idea of the quantity or weight represented by a litre or a milligram. I will go still further, and say that, as regards the unfortunate notation of parts per million, it has not yet fallen to my lot to meet with any Englishman (myself not excepted) who could form a fair mental conception of what a million really is. I am aware that it will be urged against my arguments that the reports of analysts are made to stand as permanent records for the guidance of future analysts, but to that I reply that, should the metrical system be so far advanced in the 20th century as to be generally adopted, trained analysts will then be as readily able to translate the grains per gallon of the 19th century into the milligram per litre, or parts per million, or whatever other denomination may by that time have been invented, as we are to-day able to translate Frankland's or Wanklyn's statements into grains per gallon.

If the advocates of the metrical system of weights and measures should so far succeed as ultimately to get that system adopted in this country, then by all means let analyses be reported according to it, but until it is so adopted—not merely, as at present, optionally (which option is never exercised), but as a matter of necessity—I think the report should be made in such a way that a person of ordinary intelligence has a fair opportunity of understanding what the statements mean.

I am also aware that it may be urged by some that the processes of analysis are simplified by the adoption of the metrical system, but I dissent from this. In my own Laboratory I use and recognize no other unit of weight than a grain, and in an analysis of water no other unit of measure, than the decimal parts of a gallon. The grain, as a unit of weight, cannot, at any rate, be simplified, and the measure of 1-10th, 1-100th, or 1-1000th of a gallon is not worthy to be called a complication. I therefore express my opinion most decidedly in favour of the adoption of the system of grains and gallons only, for reporting the results of water analyses.

Having now referred to the figures which I think should be employed to report the results in, I come to consider what results should be reported, and this naturally resolves itself into the question of whether the Frankland process or the Wanklyn process should be followed, and whether either of these processes should be supplemented by means of other determinations. It is to be noticed that in both cases the latter part of the instructions for carrying out these rival processes, contain full details for sundry other determinations than the organic carbon and nitrogen, and previous sewage contamination, which are the bases of the Frankland process, and the albuminoid ammonia, which is the basis of the Wanklyn process; but it is not by any means clear in what way these supplemental determinations are to be used or considered in appraising the results of the analyses.

Let us see first what are the objections to each of these processes. First, as regards the Frankland process, the personal equation or amount of experimental error involved in working the process is so excessively great that an allowance amounting to more than the degree of impurity present in ordinary drinking water has to be made before the results can be even *supposed* to be correct. No doubt it is extremely easy to make a few blank experiments and to deduct a constant found by these, from the impurities found in the course of a water analysis, but, in my opinion, a constant found in this way is not either identical or fairly comparable with the constant which really

occurs when a water residue is treated—that is the two constants are obtained under different conditions, and therefore are not directly comparable with each other, and as a necessary consequence the deduction made by those who use the Frankland process is only by accident an accurate one. If my view on this point is right it is clear that all attempt to rely upon the determination of organic carbon and nitrogen as an indication of present sewage contamination, even when the process is carried out by a skilful manipulator, must be useless; but we have, in addition, to bear in mind that the manipulation involved in the process is so difficult and tedious that, although the process has been before the public for ten years, viz., since 1868, it would hardly be possible to find ten analysts in the United Kingdom who regularly use it.

I pass now to the Wanklyn process—this certainly possesses the advantage of extreme simplicity, and with the slightest care in manipulation, it is also accurate, *i.e.*, it gives uniform results from the same samples provided it is analyzed while moderately fresh. There are, however, one or two defects in the determination of albuminoid ammonia which are not always sufficiently considered, among these is that urea—which, if not the most dangerous, will be admitted to be one of the most significant indicators of impurity—is not detected by it, and that some of the other nitrogenous compounds, which are quite likely to occur as occasional impurities in drinking water, yield up their nitrogen in the form of albuminoid ammonia in such an irregular proportion that the difficulty of forming a judgment from this one estimation only is considerably increased. So while I still consider that the determination of albuminoid ammonia, according to Wanklyn's process, is the most important and the most valuable determination in the whole analysis, I do not assent to the extreme weight or value (practically excluding all other determinations) which is now placed upon it by its inventors. Wanklyn, in the preface to the fourth edition of his treatise on Water Analysis, says that he is "now prepared to trust to a direct test for the actual presence or absence of organic matter, and can afford to discard indirect and in many instances delusive signs." Carrying this statement to the extreme, we make a *reductio ad absurdum* of it, for we find that if 20 grains of urea were present in a gallon of water the sample would still be passed as absolutely pure.

I think, therefore, that this determination of albuminoid ammonia, valuable as it is, as indicating present contamination, in the form of a very large number of nitrogenous compounds, must be supplemented by determinations which show also whether there has been previous contamination, or, in other words, what nitrogen in other forms is present. I do not view the estimation of nitrates, to quote Wanklyn's words again, "as a step in the exhaustive mineral analysis of a water residue," but I view it as essential in the analysis of a water for ordinary potable purposes. This, therefore, raises the whole question of what are the determinations necessary, and here I take what seems to me the plainest and most common-sense view of the matter when I state that the report should specify every determination which has been made in the analysis of the water, and that the opinion given upon the water should be based upon the deductions drawn from *every one* of those determinations. If an opinion is given upon determinations which are not specified in the report itself it is very possible that some analyst at a future time may be misled, as I was not long since by a report which stated that a water only contained 17 grains of total solid matter, and was therefore quite free from organic impurity. If a determination is worth making at all it is

worth writing, and if it is worth writing it certainly ought to be worth consideration of some kind in forming an opinion on the results—if this is not the case time has been wasted in making it. For instance, if it is worth determining the salt, it must be because salt in some proportion or other, may be a deleterious constituent in water, and therefore in deciding what general report should be given upon the water in question due weight (whatever that may be) should be given to the proportion of salt found to be present; and again, if it is worth while to determine hardness, it must be because hardness, in some proportion or other, is injurious, and due weight should be given to this point also.

Therefore I think that, not only should all the figures be stated in the report, but that the statement should be made to assume a uniform style, and that due weight should be given to every figure in the analysis.

In drawing the inferences both Frankland and Wanklyn have, to *some* extent but not fully, adopted this view, for when we look to the original instructions for the Frankland process, or the amended instructions contained in the latest edition of Sutton's volumetric analysis, or when we take the 4th edition of Wanklyn's Treatise on Water Analysis, we find instructions for a considerable number of other determinations, beyond those which are distinctly included in the figures upon which Frankland and Wanklyn respectively base their opinion as to the character of the water. Thus, for instance, Wanklyn is quite prepared to trust to albuminoid ammonia only, yet he gives full instructions for the determinations of salt, hardness, and numerous other constituents, and Frankland bases his opinion of present contamination upon organic nitrogen and carbon only, yet he also gives rules for the determination of salt, hardness and other constituents. Both however are alike, as far as I know at present, in giving absolutely no instructions whatever for what I consider one of the most important points, namely, a microscopical examination. It is clear that Dr. Frankland does not think this unnecessary, because, in his reports on the water supply of the metropolis, we frequently find reference to the living organisms which, by the aid of the microscope, he has found in water, but whether these living organisms are those which may strictly be called microscopic, or whether they belong to that larger class which may be detected by a good pocket lens, I am not able to say.

Having so far pointed out the difference of opinion which I hold from the statements of the inventors of these two processes, I will next point out what I do really consider essential. I think the determination of total solids is essential, because they may be so heavy as to be sufficient to condemn a water, and I certainly have a statement by Wanklyn in favour of this opinion: for he says, "unless the water contains more than 40 grs. of total solids per gallon no exception need be taken to the total solids as such." If these words mean anything at all, they mean that 40 grs. and upwards of total solids are injurious to the character of the water. I carry it further still, and say that I prefer to have a water like that of Loch Katrine rather than that supplied by the Kent Company, and, therefore, I give a certain, and, in my opinion, due weight, to the proportion of total solids per gallon contained in the water. I also think it necessary to determine the volatile matter, or loss on ignition, and here I differ entirely from both Frankland and Wanklyn, although I am in accord with Miller, who says that an error of weighing in this case is one of the most important errors in the whole analysis. Again, I think it necessary to make a determination of the amount of salt, and Miller, Frankland, and Wanklyn, all think so as well, but none of them seem to place any

special value upon the determination when it has been made. The nearest reference to it that I can call to mind now is in the Fourth Edition of Wanklyn's book, p. 15, where he says, "It occasionally happens that the finding of a little or no chlorine in water is a valuable criterion of purity." I would only alter this sentence by substituting "always" for "occasionally." On the next page he says, "When water is found to contain much chlorine, there is reason for suspecting the presence of sewage." I quite agree with this, and therefore I consider it essential to give a distinct value to every unit of chlorine in the form of chlorides which the water contains. I think, too, the hardness should be determined, because independently of the mere waste of soap which is incurred by the use of hard water, those who have (as I unfortunately have) daily experience in the use of an objectionably hard water, are well aware of the unpleasant sensations produced in washing with it, and of the great difficulty of making tea or coffee, or similar infusions of an equally palatable quality to those which can be obtained from a soft water. The free ammonia should also be determined, and in this respect I agree with both Frankland and Wanklyn; but, unfortunately, the latter's statement in reference to it appears in such an obscure manner on p. 40 of his Fourth Edition, that it would be frequently overlooked, although, as I think, it is one of the most important statements in the book. He says, "when the free ammonia exceeds ·08 parts per million, it almost invariably proceeds from the formation of urea into carbonate of ammonia, and is a sign that the water in question consists of diluted urine in a very recent condition." I can scarcely think of any words to condemn a water more strongly than those I have quoted. "*Diluted urine in a very recent condition*" must be one of the very worst waters which can possibly be used for drinking purposes. Therefore I have Wanklyn's authority to confirm me in putting a certain definite value upon the free ammonia present. I also determine the nitrates and nitrites, and consider these determinations necessary, because they are, to a very great extent, an index, although *not an accurate measure* of the *previous* contamination of the water. Nitrites are, of course, worse than nitrates, because the oxidation has not proceeded so far; but in either case these so-called mineral salts have organic origin, and, therefore, they are proof of contamination, which, although it is not exactly dangerous at the time the sample is being examined, shows that at some time contamination has occurred, and where it *has* occurred, it may recur again at any time.* The estimation of oxygen absorbed by organic matter from a solution of permanganate of potash comes very much in the same category. Water which is thoroughly oxidised, and, therefore, fairly freed from deleterious substances in an active form, will decolourise only a very small portion of permanganate solution, and I think there can be no question on the part of anyone who has been in the habit of working with this solution on a variety of samples of

* Mr. Stoddart, of Bristol, writes in reference to the water supply of that place that it is brought 20 miles from the Mendip hills, that there is no possibility of sewage contaminaton, that it is brought in closed iron pipes into a very large reservoir, which is made of limestone, and slopes very considerably. There are no bacteria or animalculæ whatever that he has seen, but it is a very good collecting ground for diatomaceæ; when the sides of the reservoir get dry the diatoms die and furnish a large quantity of ammonia, which give rise of course to nitrates; many a time when he has made a good collection of diatomaceæ in a small bottle he had not had time to look at them when he reached home, and had consequently put them aside till the next day, when the ammoniacal smell was so abominable and just like animal matter that sometimes he thought it was a misnomer to call them vegetable. The only fault of the supply is that it is not perfectly filtered and free from minute portions of the dead diatoms. All the nitrates are solely derived from the dead diatoms.

water, that it does form a very fair and reasonable test as to the amount of organic impurity present. I quite agree with the remark Miller makes in reference to it, that as a substitute it is probably useless, but that as an accessory it does good service.

Passing now from the strictly chemical results, it is quite possible to meet with samples of water, and I have in fact seen several such, which contain so much recent urine that the urea, and in some cases the urate of potash, can be distinguished by the microscope in the residue left by the evaporation of one or two drops. It is obvious that such waters as these are totally unfit for human consumption, and yet the albuminoid ammonia would fail to detect this impurity: the oxygen absorbed would indicate it in part only, and the free ammonia to an even less extent; while I apprehend that there is hardly any chemist who would object to the statement that living organisms of any kind whatever, and all growths of the bacteria class, are injurious; and yet the microscope, and that alone is the only means by which these impurities can be detected. I consider that no sample of water should be passed as good unless it has been microscopically examined, and this examination should be credited with its due weight in the report, and, if necessary, the water should be condemned on the result of that examination alone.

Taste and smell also afford valuable indications when they are taken in the proper way. Not long since I analysed a sample of water which was in almost every respect chemically satisfactory, and it showed no objectionable features under the microscope, but when it was slightly warmed and the smell ascertained by drawing air through a tube, the walls of which were moistened with it, there was such an offensive odour of sulphuretted hydrogen as to fully account for all the complaints which had been made about it. Surely then this is enough to condemn a water upon. I condemned this water without any hesitation, and yet the albuminoid ammonia was low. Nor is this offensive smell of sulphuretted hydrogen confined to this particular sample, for some of the deep well chalk waters, which are taken by Frankland as a standard of purity, and in which the nitrates are ignored by those who report simply according to the albuminoid ammonia, contain enough sulphate of lime and organic matter to cause decomposition to set up, and a distinct smell of sulphuretted hydrogen is produced when the water has been standing in a cistern for twelve or twenty-four hours. I have known cases too, and that not a few, where the determination of colour is of value. I am quite aware that a difference of opinion prevails as to whether peaty matter is objectionable; my opinion is that it is. I think the gathering grounds should be free from peat as well as from other impurities, and probably no other test so readily recognizes the presence of peat as the colour of the water when seen through a stratum of 2-ft. deep.

I think there are cases where the determination of magnesia and the alkalies and phosphoric acid may be necessary, but these cases occur comparatively seldom, and the determinations, on account of the small quantities present, are attended with so much difficulty and uncertainty that for the present I omit them from my remarks.

Summing up the whole, therefore, I consider it necessary in every case to determine the total solids, loss on ignition after deducting combined carbonic acid, hardness before and after boiling, chlorine calculated as chloride of sodium, nitrogen in the four forms of free ammonia, albuminoid ammonia, nitrates and nitrites, oxygen absorbed by organic matter, colour in 2-ft. tube, taste and smell when warmed, and the absence or presence of suspended matter, and also to examine the residue microscopically. If these results show

a doubtful character in the water, I think it necessary to consider the results of Heisch's sugar test, so as to get a confirmation or otherwise of my opinion on the other results, but this examination should be made while the sample is fresh.

Of course I am quite aware that a complete investigation of this kind renders it quite impracticable to analyse waters for a guinea, but I confess that I have no regret on this point, as I think it is very much better, both for the public and the analyst, to have one sample thoroughly examined and fully reported upon in a report which shall have a reliable basis, than to have half a dozen samples analysed and reported upon with so few determinations made that the opinions given are unsatisfactory.

Having pointed out what determinations I make, the next question is how to appraise or estimate each of them at its true value. Of course the difficulty of doing this is considerable, but having once granted that these determinations are desirable, and also that, if a determination is desirable and has been made, some weight should be given to it in the calculations of the results, the matter is somewhat simplified. The first mode, according to which a scale of this kind can be formed, is to consider what amount of any one of the constituents shown by the analytical figures already referred to would be sufficient to keep the water from ranking as first class, supposing that all the other constituents were of a fairly satisfactory character, or, to put it in another way, supposing that the ammonia, albuminoid ammonia, nitrates and nitrites, were all good, what amount of total solids would condemn the water and relegate it to the second class; or supposing that the total solids were also good, what amount of salt would be sufficient to lower its rank. I take this as the starting point for the formation of a valuation scale, and I think we may say that 75 grains of total solids per gallon, or 15 grains of loss on ignition after carbonic acid has been deducted, or 15 grains of salt, or .015 of a grain of albuminoid ammonia, or 1.5 grains of nitrogen as nitrates (equal to nearly 10 grains of nitrate of soda per gallon,) or .15 of a grain of oxygen absorbed from permanganate, should each be held to be decidedly objectionable chemical characteristics, while as to the physical ones I think that a water which has a urine yellow colour when viewed through a tube two feet long, or which has a decidedly offensive taste or smell of sulphuretted hydrogen, or which shows any traces of copper, or when examined by the microscsope shows fungoid growths, or a large proportion of peaty matter, should also be considered as lower than first class. Therefore, here we have the basis of a valuation scale for reports on water analysis.

Of course what I have said at present relates simply to the ratios which subsist between the different constituents, but it is perfectly clear that we must take some definite figure as the basis upon which to calculate these ratios. Now I have come to the conclusion that the easiest mode of forming this scale is to adopt the smallest basis of measurement as the unit of the scale, therefore as I consider that albuminoid ammonia is the most injurious factor in the analysis, and that .001 of a grain per gallon of that constituent is probably the most minute measurement to which it is really necessary to carry the valuation at present, I consider that .001 of a grain per gallon of albuminoid ammonia is equal to 1 degree of impurity; nitrogen in the form of nitrites takes rank next because it indicates that some organic matter has become converted into so-called mineral nitrogenous compounds, but yet has not been fully oxidized; still I view nitrogen when present in this form as of only half the importance or value that I do when it is present in the form of albuminoid ammonia. I therefore estimate

that .002 of nitrogen as nitrites equals 1 degree of impurity. Next I rank the oxygen absorbed by organic matter, and here, though I am quite aware that it will be one of the most disputed points in the whole scale, I have assumed that .01 equals 1 degree of impurity, *i.e.*, I estimate oxygen absorbed at 1/10th of the value I give to the albuminoid ammonia. Free ammonia comes next, and considering that it may be derived and frequently is derived from other sources than the decomposition of urea I value this at one-half the value I give to oxygen absorbed, that is .02 of free ammonia is equal to 1 degree of impurity. Nitrogen as nitrates is of course far less important, and I estimate this at 1/5th of the value of free ammonia, so that .100 of nitrogen as nitrates equals 1 degree of impurity.

Leaving the nitro-compounds I come to the general mineral constituents of the analysis, and here I have not only valued the total solids, but also to some, although to a different extent, the constituents of which these total solids consist, that is for every 5 grains of total solids, I allow a definite value of 1; for every 1 grain of loss on ignition, carbonic acid being deducted, I give a definite value of 1, as I also do to every 1 grain of salt, and I add together the hardness before and after boiling, and for every 5 degrees of the total hardness so obtained I count 1. This amounts to the same thing as giving a value of 1 to every 5 degrees of temporary hardness, and a value of 2 to every 5 degrees of permanent hardness. For traces of copper or traces of lead, both of which, however minute, I consider are exceedingly objectionable characteristics in drinking water, I allow a value of 6.

Passing now from the strictly chemical tests to the physical ones, I class a good taste as 0; a taste of decaying leaves or flat rain water as 2, while for more offensive tastes still, I allow higher values up to 10. For a yellow green colour, giving decided indications of either vegetable or urinary contamination or both, I allow a value of 4; for a full urine yellow, 6, and the values of the microscopical results range from 3, for the presence of a few bacteria, up to 12, for a residue full of animal organic remains, and even as high as 18 where urea and muscular fibre can be detected in the dried residue of a few drops.

From my remarks further on it will be evident as regards the physical as distinguished from the chemical tests, that these values must at present be viewed as an outline only, because the intermediate numbers have to be filled up. It is extremely difficult to discriminate in mere words between the different gradations of smell, taste, and microscopic appearance. But taken as an outline the table stands this way :—

5 grs. total solids	= 1	Taste, decidedly offensive	= 6
1 gr. loss on ignition	= 1	Smell, flat rain water	= 2
1 gr. chlorine calculated as chloride of sodium	= 1	Ditto urine	= 6
·0200 gr. free ammonia	= 1	Colour, pale yellow	= 2
·0010 gr. albuminoid ammonia	= 1	Ditto yellow green	= 4
·1000 gr. nitrates	= 1	Ditto urine yellow	= 6
·0020 gr. nitrites	= 1	Ditto opaque yellow in 2-ft. tube	= 9
·0100 gr. oxygen absorbed	= 1	Microscope, bacteria	= 3
5 degrees total hardness	= 1	Ditto, other similar growths in greater quantity	= 4
Traces of lead	= 6	Ditto, few living organisms	= 6
Ditto copper	= 6	Ditto, animal remains	= 12
Heisch's sugar test	= 6	Ditto, urea and urates and muscular fibre...	= 18
Taste, good	= 0	Suspended matter, traces	= 2
Ditto, sligbtly saline	= 1	Ditto heavy	= 4
Ditto, decayed leaves	= 2		
Ditto, flat rain water	= 2		

The question now arises how does this scale work out, and where are the limits of purity fairly to be drawn upon ordinary waters. I reply, it is only by undertaking, as I have recently done, the somewhat difficult task of sorting nearly 200 waters in as far as could be an approximate order of merit, that it is possible to answer this question, and I have come to the general conclusion that a valuation falling below 35 may be taken to

indicate a first-class water, to which no exception can fairly be taken; that a valuation of between 35 and 55 may be taken as a 2nd class water; and one between 55 and 75 as a third class water which is of a suspiciously dangerous character, while those samples which give a higher value than 75 should be considered as waters of such a dangerously contaminated character that they can only rank as sewage. To take a comparatively familiar illustration of the first class waters. The ordinary supplies of the London water companies, when in good condition, will show a value on this scale generally ranging between 15 and 22.

As regards the chemical results obtained, it is evident from what I have said, that all analysts who adopt this scale would agree in the calculation of the results, but a certain difficulty, and by no means an inconsiderable one, arises when we come to the physical tests. Every analyst is able to make an accurate determination of 5 grains of total solid matter per gallon, but it is extremely difficult for me to convey to others, or for others to understand from me what I mean by a flat or an offensive smell. At present I am hardly able to bring forward such illustrations as I should wish on the matter, but I am endeavouring to make standard solutions which shall serve as representations of the numbers or values which I attach in my scale to smell, colour, and taste. The microscope will then be the main point on which a true difference of opinion may exist, which will of course lead to a difference of valuation. I scarcely know in what way this difficulty is best to be overcome, but should the suggestions I am making, and the scale I am proposing, meet with fair acceptance at the hands of the analysts generally, I should have great pleasure in attempting to prepare a series of say 3 or 4 different slides, giving actual microscopical illustrations of what I understand by the numbers in my scale. As regards urea and such salts there is no difficulty, for of course a standard solution can be made to which a certain amount of sulphate of lime and salt, and other ordinary constituents of drinking water, may be added, but as regards the confervoid and other growths, and animalculæ, it is evident that no plan can be adopted but the preparation of a standard set of slides. If I can succeed in this as I hope, the valuation will then so far be strictly comparable with a standard, and will be free from every trace of personal equation or personal bias.

It is right now that I should give some illustrations of these figures and the analyses of some few samples, and showing the manner in which this valuation works, the figures are those of actual analyses recently made. The figures are grains per gallon.

No.	1	2	3	4	5	6
Total Solids	5.00	25.50	6.12	228.80	103.80	141.80
Volatile matter	0.95	0.25	1.92	3.68	11.30	28.50
Chlorine calculated as Chloride of Sodium	0.94	3.51	2.00	182 87	29.07	59.67
Hardness before boiling	0.8°	13.2°	1.9°	20.8°	36°	52°
Ditto after boiling	0.7°	2.4°	1.9°	7.2°	19°	42°
Nitrogen as free ammonia	0.0030	0.0025	0.0118	0.0020	0.0029	0.0291
Ditto as albuminoid ammonia	0.0020	0.0030	0.0102	0.0024	0.0270	0.0158
Ditto as Nitrates	0.0240	0.0700	0.0670	0.7696	4.1300	5.4604
Ditto as Nitrites	0.0043	trace	0.0030	0.0058	0.0040	0.0064
Total combined Nitrogen	0.0333	0.0755	0.0920	0.7798	4.1639	5.5117
Oxygen absorbed	0.0300	trace	0.0240	0.1088	0.0540	0.1200
Suspended matter	trace	none	trace	trace	none	heavy
Colour	pale blue	pale blue	—	fair	dirty opaque yellow	urine yellow
Smell	satisfactory	good	—	,,	fair	fair
Taste	fair	,,	—	briny	,,	saline
Microscope	amorphous & rootlets	satisfactory	satisfactory	earthy matters	unsatisfactory	satisfactory
Lead and Copper	none	none	none	none	none	none
Iron	none	trace	trace	trace	trace	heavy
Value according to my scale	12	14	24	185	159	256

The best water in the above series is, in my opinion, the No. 1 sample, and on looking through the figures it will be seen that there are only five lines in which a hi-her value than one is given to any determination. Nitrogen, as albuminoid ammonia, showing ·0C2 ranks as 2; oxygen absorbed ranks as 3; suspended matter ranks as 2, the taste which is flat like rain water is also 2, and the microscope, which shows amorphous sedimentary matter and rootlets but no animal matter, ranks as 2. I may take next the case of No. 2, which is another good water, and here the total solids value at 5, the salt 3, double hardness 3, albuminoid ammonia 3, while the physical tests are all so satisfactory that there is no addition to be made for any of them. As the next illustration I may take No. 3. Here we have a rather large proportion of albuminoid ammonia, namely, ·0102, this amount being heavier than often occurs in first class water, yet when the other figures are viewed, and especially the low proportions of total solids and salt, the softness and the entire absence of unsatisfactory physical characteristics, it is not surprising that the value of the water is as low as 24.

Passing now to one or two cases where the proportions of impurity are larger still. Nos. 4 and 5 will illustrate the scale very well. In the No. 4 sample the albuminoid ammonia was only ·0024, and the only objectionable physical characteristic was the presence of earthy matter, shown by the microscope, but the chemical tests disclosed the presence of 182·87 grains of chlorine calculated as chloride of sodium, per gallon, and combined with this there is a considerable proportion of nitrogen as nitrates, and the valuation therefore runs up to 185. This sample consequently ranks as unmistakable sewage, despite the low albuminoid ammonia. We have another illustration in No. 5, where the albuminoid ammonia is high enough to already condemn the sample, even if no other determination were made, that is, this factor is 11 times as high as in the last sample referred to; but this sample being considerably less saline, the valuation of it, although still placing it in the sewage class, is somewhat lower than No. 4.

In No. 6 we have a still heavier valuation. Here also the albuminoid ammonia is so high that the water would have passed as third class on that alone, but when other circumstances are taken into account, the condemnation is proved to be still greater, and the water ranks as one of the very worst I have seen for a long time. Thus it contains 28½ grains of volatile matter, nearly 60 grains of salt, the permanent hardness is 42, and the nitrogen as nitrates is 5·46 grains per gallon. This water affords a very good illustration of the fact, that although in some cases it may appear that I have placed an undue value on physical tests, yet that on the whole, my scale must be a fair approximation to the truth, for in this water I find that the smell was fair, the microscopical results satisfactory, the taste saline, which of course must be expected, the colour was only a pale yellow, and the only really unsatisfactory physical determination was that there was a considerable quantity of suspended matter. This water therefore takes worst rank without the physical tests having any particular weight.

I think I have now explained as fully as space will permit, the scheme I propose for the valuation of drinking waters, and the manner in which I think the results should be stated, and I invite the criticisms, not only of the members of this Society, but of all analysts on the proposals. It must be borne in mind in the discussion, that I do not propose any new methods or new processes. I think the discussion would be far better not complicated by any extraneous matters of that kind at present, I am simply considering the recognized determinations and methods, and the deductions which should be drawn from them, and the modes in which they should be stated.

The first question asked will naturally be:—What do I claim for this scale? My reply is a far better method of estimating or valuing the relative degrees of impurities in water than has hitherto been proposed. I do not claim that at present the scale is perfect in all its figures. I am quite aware that difference of opinion may, and to some extent must exist, as to the relative importance to be attached to some of the determinations in question, and these are points which are fairly open to argument, and which I should like to discuss so as to make the scale one which can be uniformly adopted; but while admitting that some of the figures are open to discussion, I claim that the broad fact, that every determination made should be stated and should be taken into account, is one which lies at the very foundation of any system of forming an accurate opinion upon the character of a water.

In the discussion which took place:—

Dr. Bartlett said he thought the plan Mr. Wigner had adopted was an excellent one, but the valuations were of course to be discussed, as that was one of the main issues. He should take exception to the salt in moderate quantity being considered as a measure of sewage impurities. Many waters originally pure contain large quantities of chloride of sodium or other alkaline earths, and he believed there was no objection to a water containing a moderate proportion of salt, but he declined to discuss then the question of how much was wholesome or unwholesome, but there would be no objection to a pure water containing 20 to 30 grains per gallon, but when we come to 185 grains that is different. He found Mr. Wigner had not estimated the SO_3, which he (Dr. Bartlett) considered a very objectionable element in drinking water,—especially sulphates of lime and magnesia. Mr. Wigner said he intended to give illustrations of bad smells, and he (Dr. Bartlett) was curious to know how he would do it, but he thought there should be plus and minus signs, so that waters which were moderately objectionable might be excused by reason of their being in some other respects good. He had always condemned waters which had an unpleasant smell. He also had had waters which, according to the Frankland and Wanklyn methods were pure, with a very small amount of total solids, and yet they came from medical men who attributed illness to a slight smell and a slight peaty colour. One water was analysed nine times, and nothing found except a smell of sulphurreted hydrogen, and a peaty colour, and yet this water was almost conclusively proved to have caused illness.

Mr. Hehner did not know why Mr. Wigner objected so much to the metrical system. he did not suppose Mr. Wigner reported the analyses of sugar in grains per gallon but in percentages, and therefore to report water in parts per million would be only carrying it one step further. He did not think urea and urates could be present in such large quantities that they could be determined; the presence of fœces would be much more objectionable than urea or urates. If the sulphates were determined, and very little found, it would be clear that as urine contains a very large amount of sulphates, the chlorine did not come from urine.

Dr. Dupré said there was little doubt but that Mr. Wigner had begun the right way in stating that everything that was worth determining was worth giving a certain weight to. As to the valuation he thought there ought to be some squares and cubes, so that the figures should not be simply multiplied, but increased in a greater ratio. He was quite sure that nitrates in a deep well water ought not to be put on the same footing as nitrates in a shallow well; in the one case it is an impurity almost harmless, but in the case of a

shallow well it is different. And the same remark would hold good to a great extent with ammonia, which, however, is not found in such large quantities. As to potash and soda, the determination of the relative proportions of the chlorides might show whether the contamination was of human or animal origin, and this is important, because human beings are not so liable to catch disease from an animal, whereas the urine from a human being is much more likely to cause disease.

In reply, Mr. Wigner pointed out that an indirect value was given to sulphates, inasmuch as permanent hardness was in the majority of cases a fair measure of their amount, and this, by the scale adopted, was valued twice as high as temporary hardness. The plan proposed by Dr. Bartlett, of passing salt or other impurities up to a certain point as harmless, appeared to him wrong. Small quantities of salt *may be* of minor importance, but if so, and the scale is wrong, let it be altered. The first rule should be to give a certain condemning influence to *every* impurity. Mr. Wigner considered Mr. Hehner's remark, comparing percentages with parts per million, rather an unfair comparison, because every man of common sense could grasp the 100 parts, whereas no fair conception could be formed of a million units. The difficulty was increased just ten thousand-fold. As to Dr. Dupré's remarks he (Mr. Wigner) considered there was force in what he said as to the increasing values as the proportion increase, but unless an exhaustive examination of the well had been made he could not assent to give a lower value to nitrates in a deep well water than in a shallow well water, because deep wells were in very many cases contaminated with surface drainage. In illustration of this Mr. Wigner pointed out that in the 6th Report of the Rivers Pollution Commission it was stated that out of "21 samples of water from indisputably unpolluted sources" only two were condemned, and these were both from St. Boniface's Wishing Well. But anyone who knew this well and St. Boniface Down as thoroughly as he did, would immediately find the cause of the pollution to arise from a large natural hollow on the surface of the down where the droppings of cattle pastured on the Down gradually accumulated and were washed down by the collected rain, which really formed the true supply of the "Wishing Well." The rain soaked through so rapidly that there was a great increase in the flow of the well so soon as one hour after rain. Therefore this "unpolluted source" was really a polluted one.

Additional Note on the above Subject—

I think there is considerable weight in the remarks made after the reading of my paper by Dr. Dupré, as to the desirability of an increasing scale of value when certain figures in the analysis are excessive. The effect which this alteration was intended by Dr. Dupré to have was to render certain high values of certain constituents absolutely prohibitory by ensuring the condemnation of the sample. I think this result will be very readily achieived by a slight modification of the scale. It will be seen by an examination of the specimen analyses (and perhaps still better by the application of the scale to other *complete* analyses already available), that a water of even passably good quality will rarely show any single determination in the analysis of a value so high as 10. Therefore if the simple rule is taken of doubling the excess of value over 10 attached to any single determination, the scale will not be any more stringent as regards the pure waters, while it would be a stronger condemnation of the impure ones.

It would act in this way, if the albuminoid ammonia in a sample is .009 grains per gallon it would value as 9. If it were .014 the excess above .010 would be valued at the doubled ratio, and we should consequently have .010 = 10 + .004 = 8, total 18; similarly if the nitrogen as nitrates were 1.000 grains, the value would be 10, but if the constituent were present in the proportion of 2.000 grains, the excess proportion would be doubled in importance, and the value would be 30. I think this modification will improve the scale without greatly complicating it.

G. W. W.

PUBLIC ANALYSTS' WORK DURING 1877.

In reply to the request contained in our last number we have received a large number of returns from various public analysts, but we are unable at present to give a tabulated statement of the number of samples examined, &c., as the list is not complete. We therefore again call the attention of those gentlemen who have not yet sent us in their returns, and we trust they will kindly favour us with them by the 20th instant, in order that our table may be as complete as possible.

REPORT BY THE PRINCIPAL OF THE SOMERSET HOUSE LABORATORY.

We extract the following from the 20th Report of the Commissioners of Inland Revenue just published :—

"The number of samples examined during the year ended 31st March last amounted to 13,128, representing an average of 43 samples examined and reported upon during each official day. These numbers, however, do not fully represent the whole work of the Department, as in every case referred under the Sale of Food and Drugs' Act, and in cases where a prosecution is likely to arise, or where data are to be furnished for future guidance, the experiments are performed in duplicate. The total number embraces 200 different articles, and as many of these were special in their composition and character, the general processes of analysis published were only partially applicable to them, and consequently the processes given had either to be moidfied, or new ones to be devised to meet our requirements.

"Under the Sale of Food and Drugs' Act, 32 cases, embracing samples of butter, milk, bread, oatmeal, arrowroot, mustard, tea, whisky, and preserved peas were referred to us by the magistrates. In the majority of cases the reference was made at the request of the defendants, but several were referred at the solicitation of the prosecution. In some instances we arrived at conclusions which differed from those of the local analyst, but in a large majority of the cases his results were confirmed.

"Among the cases referred to us from Scotland was a notable one of whisky which was adulterated with nearly one ounce of sulphuric acid per gallon. This adulterant not only made the whisky highly unpalatable, but probably accounted for the complaints of illness which had been made to the local authorities by those who had used it. In another case, a sample of butter, also from Scotland, was reported by the local analyst to contain 54 per cent. of foreign fat. Two scientific witnesses, who had examined the sample, gave evidence for the defence to the effect that when the butter was examined by the old mode of analysis the results were consistent with a genuine butter. They also stated that in their opinion there were no well-established means of distinguishing butter fat from other animal fats, and that the new method of analysis relied upon by the prosecution had not been sufficiently tested to establish its reliability, but they

admitted that if the new processes were trustworthy, then the sample was adulterated. The sample was referred to us by desire of the prosecution, with a request from the sheriff-substitute of Lanarkshire, who had heard the case, that an opinion should be given as to the trustworthiness of the processes adopted by the analyst for the prosecution. A report was made expressing confidence in the method of analysis—which had in fact been partly devised by ourselves—adopted by the prosecution, and stating that the sample consisted almost entirely of foreign fat, which appeared to have been worked up with a little milk. Within a day or two after the case had been disposed of, one of the local papers gave an account of an artificial butter manufactory, which existed in the town, from which the sample had been sent. Details of the apparatus were given, and by the process of manufacture described, which consisted primarily in churning purified melted fat with milk, an article would be produced which would exactly correspond with the terms of our report on the sample. The existence of the manufactory, and the manufacture of "butterine" by the process described, were placed beyond a doubt by subsequent proceedings in a court of justice.

"A sample of preserved peas, in the examination of which we practically confirmed the result arrived at by the local analyst, was found adulterated with copper to an extent which the magistrate held to be injurious to health.

"We have continued our investigations into the composition of certain articles of food, especially of milk and butter, to determine the variation in the composition of genuine samples, and also to observe the changes effected by keeping under various condition, at different seasons of the year. These enquiries are slow and tedious, and involve a considerable expenditure of time and labour. We find the information thus obtained of the greatest value in dealing with samples referred to us for analysis,* and in arriving at a decision in any case it is our invariable practice to take the whole of the constituents, and not one or two only, into consideration, as we consider that by such means only can we arrive at a sound conclusion."

HOUSE OF COMMONS.

12th February, 1878.

SALE OF FOOD AND DRUGS' ACT.

Mr. ANDERSON asked the President of the Local Government Board whether his attention had been called to a recent decision of the High Court of Justiciary, Scotland, concerning the Sale of Food and Drugs' Act, 1875, by which five Judges had decided that no offence could be proved on evidence taken from any article specially bought for analysis, the buyer in such case not having been prejudiced in the purpose for which he bought it; and, further, that two of the Judges—Lords Moncrieff and Young—expressed the opinion that the sixth section did not prevent tampering with an article to the deterioration of its quality, if without the addition of extraneous matter; and whether he purposed taking any steps to prevent the Act in question becoming a dead letter.

Mr. SCLATER-BOOTH.—My attention has been called to the decision by the High Court of Justiciary in Scotland to which the hon. gentleman refers, and I regret that I have not had an opportunity of conferring with the Lord-Advocate on the subject. It seems that previous to the Scottish case alluded to no question had been raised in England as to the validity of a prosecution under the Sale of Food and Drugs' Act by a person who purchases only with a view to analysis, and in the cases which have occurred since the magistrates have decided against the objection when raised. I concur in that

* This is the information which was asked for by the resolution of the Society of Public Analysts, and which, as will be seen by the correspondence, was refused by the Inland Revenue Chemists.—EDITORS ANALYST.

view, which, be it observed, is also the view of some of the Scottish Judges, and I cannot believe that the High Court of Justice, if appealed to, will come to any other decision. I am, therefore, not prepared, as at present advised, to introduce an amending Bill, though, if my anticipations were disappointed, such a step might be necessary. *Times.*

ANALYSIS OF WINE.

We note that in Paris one of the clauses of our Sale of Food Act has been put in operation, thus showing that our Gallic neighbours are not above following our example when they consider it expedient to do so. The alleged adulteration of wine by means of fuchsine, and the dangers which it may cause to public health, have given rise in Paris to new measures of repression. Formerly, the examination was made on the premises of the wine merchant, and was conducted without any serious control or exactitude. Now, however, a special Commission is sent to the vendor's premises. If a wine is suspected of sophistication, the Commissioner takes two samples, which are sealed. One of the samples is left with the merchant, who must present it intact on application. The other sample is sent to chemists, officially appointed—public analysts in fact—who are not permitted to know the name of the vendor. The analysis is thus prepared with all sincerity, and without consideration for individuals. If the presence of fuchsine or other dangerous matter is detected, the wine merchant is called upon to produce the sample left with him; it is compared with the wine officially analysed, and identity being proved, the merchant is punished. He is not able to tamper with the sample left with him, and consequently, he cannot say that he did not sell the wine as analysed. It is thought that much good will be done, in the way of repressing adulteration, by the adoption of this new system. The method of dealing with suspected samples is somewhat similar to that established by our own Sale of Food and Drugs Act.

AN EXTRAORDINARY MINERAL SPRING.

The *Boston Journal of Chemistry* publishes the following:—"A mineral spring extensively advertised in the States has recently attracted our notice, and from the circular of the owners, which is before us, we learn of its nature, as the published analysis of Dr. A. A. Hayes, State Assayer of Massachusetts, is presented, along with other recommendatory matter. Here is the statement of analysis:—In a standard gallon the following salts are present, considered as dry:—

	Parts
Silicate of potash	1·110
Sulphate of soda	0·490
Chloride of sodium	0 100
Crenate of iron	0·310
	2·010

This is extraordinary natural water, surely, but the comments of the distinguished chemist which accompany the analysis are still more remarkable. He follows with this statement to the owners, as found in the circular.

"I think much of the effect of this water in cases of *diseased digestion* is due to a *remarkable cleansing action it exerts*, being in fact a very weak solution of a kind of *soap of natural origin*. We have to many *cured cases* to allow us to doubt that the use of this water freely relieves complaints having their origin in the kidneys.

(Signed) A. A. HAYES."

THE SOCIETY OF PUBLIC ANALYSTS AND THE SOMERSET HOUSE ANALYSTS.

In accordance with the resolution passed at the Anniversary Meeting of the Society of Public Analysts, on the 16th January last, the Secretaries addressed the following letter to Mr. Bell, the Principal of the Somerset House Laboratory, and we give below his reply and the further correspondence which has since taken place :—

Society of Public Analysts,
79, Great Tower Street, London, E.C.,
22nd January, 1878.

Dear Sir,—By a resolution unanimously passed at the Anniversary Meeting of this Society, held at Burlington House, on the 16th instant, we were instructed to write and ask you to read a paper at an early Meeting of the Society, upon the standards you have adopted in your Laboratory for the analysis of butter, milk, and other adulterated articles coming to you under the Sale of Food and Drugs' Act, together if you so desire, with reference to the methods you use for the analysis of those samples. The Society decided to request you to favour them by reading this paper because they considered that it is undesirable that public analysts and yourselves, both acting under the authority of an Act of Parliament, should differ either in the interpretation of the Act or in the interpretation of the results obtained in analyses made under the Act.

We are directed to say that if you assent to this proposition we will place the entire evening on the 20th February at your disposal, and give you and those of your assistants whom you may choose to call every opportunity for reply, or if you prefer it we will call a Special Meeting upon any date that may be convenient to you, and that does not clash with the Meetings of other Societies.

It seems hardly necessary for us to add that personally we hope you will assent, and so enable a fair discussion to take place on those specially disputed subjects—Milk and Butter.

We are, dear Sir, yours truly,

(Signed) CHAS. HEISCH, G. W. WIGNER, } *Honorary Secretaries.*

J. Bell, Esq.,
Principal,
Laboratory, Somerset House.

79, Great Tower Street, London, E.C.,
28th January, 1878.

My Dear Sir,—I shall be glad if you can let me have an answer by return to our letter of 20th, in reference to the Society of Public Analysts, as I want to announce the business for next meeting in the forthcoming *Analyst*.—Yours truly,

(Signed) G. W. WIGNER,

J. Bell, Esq.,
Laboratory, Somerset House.

Laboratory, Somerset House, London, W.C.,
30th January, 1878.

Dear Sir,—I duly received your note of the 29th inst., and also that of yourself and Mr. Heisch of the 20th inst., inviting me on behalf of the Society of Public Analysts to read a paper on Milk and Butter before that Society, and to discuss certain standards of purity as adopted by its members and by ourselves.

After careful consideration it appears to me that the object you have in view would not be likely to be attained by the course proposed, but I shall be pleased to see you and Mr. Heisch at any time to talk over the matter.

I may add that you are doubtless aware that in dealing with such samples as Milk and Butter, we have been guided by the results of our own investigations into the variations in their composition, and that these results have at all times been open to the inspection of any Public Analyst who has chosen to call upon me; and I may further say that I shall be glad to see any member of your Society who may feel disposed to favor me with a visit.

I am, dear Sir, yours truly,

G. W. Wigner, Esq. *(Signed,)* J. BELL.

SOCIETY OF PUBLIC ANALYSTS,
79, GREAT TOWER STREET, LONDON,
12th February, 1878.

DEAR SIR,—We are obliged by your letter of the 30th January, replying to ours of the 20th January, but, as you will have seen from our letter, that it was written by direction of this Society, and your reply will, consequently, have to be submitted to them and published, we think it only courteous to write to you again on the matter, because we fear that, to some extent, you must have misunderstood the wish of this Society. On referring to our letter, and also to the copy of the resolution passed by the Society, which we enclose, you will see that our object is to ascertain the standards which you and your assistants have adopted, in dealing with disputed cases under the adulteration Act—having special reference to butter and milk. Now, as at present, we, as a Society, as well as individually as analysts, are completely ignorant of the standards, and of the allowances you make for decomposition, we think you will admit that there is scarcely any more suitable mode of our acquiring the information which we need, than to ask you to favour us with a paper, stating what your standards are. There are, no doubt, differences between us, but we have no means of judging, either the amount of those differences, or what the reason for them is, and we really think that such a discussion as we propose would afford the opportunity of settling the point.

Probably the question resolves itself in the matter into this—Were the cows which you have accepted as standards healthy and thoroughly milked, and does your method of analysis differ from that adopted by this Society?

Can you not see your way clear to give us the paper yet? Yours truly,

(*Signed*,) CHAS. HEISCH,
G. W. WIGNER,
Honorary Secretaries.

P.S.—Your reply by the 19th instant will be in time for our Council Meeting.

J. BELL, Esq.,
Principal,
Laboratory, Somerset House.

INLAND REVENUE, SOMERSET HOUSE, LONDON, W.C.
18th February, 1878.

SIR,—Mr. Bell having laid your letters of 22nd ultimo and subsequent dates before the Board, without whose leave he would not feel justified in attending the proposed meeting of the Society of Public Analysts, I am instructed to acquaint you that the Board do not think it expedient that Mr. Bell should attend the meeting in question. I am Sir, your obedient Servant,

(*Signed*) ADAM YOUNG,
Secretary.

CHAS. HEISCH, Esq.

SOCIETY OF PUBLIC ANALYSTS,
79, GREAT TOWER STREET, LONDON,
21st February, 1878.

SIR,—We are directed by the Council of this Society to acknowledge the receipt of your communication of the 18th inst. Your obedient Servants,

(*Signed*) CHAS. HEISCH,
G. W. WIGNER,
Honorary Secretaries.

ADAM YOUNG, Esq.,
Secretary,
Inland Revenue Department, Somerset House.

Mr. A. Wynter B[illegible] [illegible]iety a Government Grant of £20 for continuation o[illegible] of the Cobra de Capello, and we hope shortly t[illegible] n on the subject supplementary to that which [illegible]

CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

To the Editor of "The Analyst."

Sir,—In reply to your statement in the last issue of The Analyst, "That it would be interesting to know what Mr. Cleaver's figures were, and what standard he adopted," I beg to give you copies of my analyses of the Milk which were stated by me to have been adulterated.

No. 34.		No. 40.	
Solids	11.10	Solids	11.80
Fat	3.20	Fat	3.40
Solids not Fat	7.90	Solids not Fat	8.40

My certificates were to the effect that No. 34 was adulterated with 15 per cent. of water, and No. 40 with 8 per cent., so that it will be at once seen that the standard I adopted did not press at all severely on the vender. In addition to my own analyses, I also annex a copy of the reports and analyses, dated 22nd January, 1878, made on the duplicate samples at Somerset House, and signed by Messrs. J. Bell, R. Bannister, and C. Lewin.

"The sample of milk referred to in the enclosed letter, and marked No. 34, was received here on the 10th inst. The bottle was securely sealed. We hereby certify that we have analysed the Milk, and declare the results of our analyses to be as follows :—

"Solids not Fat	7.69 per cent.
Fat	3.22
Water	89.09
	100.00
Ash	0.68

"The amount of Fat is equal to that found in genuine Milk of good quality. After making allowance for the natural loss arising from decomposition through the keeping, the proportion of Solids not Fat is lower than is found in genuine Milk of low quality. From a consideration of these results we are of opinion that the Milk contains not less than seven per cent. of added water."

"The sample of Milk referred to in the enclosed letter, and marked No. 40, was received here on the inst. The bottle was securely sealed. We hereby certify that we have analysed the Milk, and declare the results of our analysis to be as follows :—

"Solid not Fat	7.95
Fat	3.43
Water	88.62
	100.00
Ash	.73

"The amount of Fat is equal to that found in genuine Milk of good quality. After making allowance for the natural loss arising from the decomposition of this Milk through keeping, the amount of Solids not Fat is low. From a consideration of these results we are of opinion that the Milk contains not less than four per cent. of added water."

These analyses were made about one month after my own, and so granting the analyses in both cases, and on both sides, to have been correctly made, the amount of natural loss is, in No. 34, .21 per cent., and in No. 40, .45 per cent., which would mean that the loss was equal to that which would be obtained by adding respectively about 3 and 6 per cent. of water to pure Milk.

This lost amount is, I consider, more loss than usually takes place in winter time, but as I do not know what method of analysis is followed by the Somerset House chemists, it is impossible to say if there is anything to account for it. The certificate does not state the amount of loss allowed for, but it is evident from these reports that the authorities (?) have some standard to guide them, and they ought, therefore, in fairness to the analyst, to make this standard (and also any others) public.

The analyses of the Somerset House chemists point to their standards of Solids not Fat being somewhere about 8.5 per cent., if 3 per cent. is allowed for natural loss, or to 8·2 per cent. if no such allowance be made.

Now Mr. Bell has once stated in evidence* that he has found a Milk giving as low as 8.2 per cent. Solids not Fat, and that he could not therefore certify to any Milk giving such a result being adulterated, but if he takes 8.2 as his standard he cannot have allowed any margin for natural loss, and as he states that there has been a natural loss he must evidently take a higher standard, so that in point of fact he has somehow altered his opinion since the Birmingham case.

* Analyst, Vol. I., page 40.

Granted Mr. Bell's analysis of his milk with 8·2 solid not fat being correct, the question arises, ought he to take that milk as a standard, knowing, as he must do, that it is of extremely rare occurrence? In fact, I believe Mr. Bell is the only analyst who has ever met with such a case.

According to the exact terms of the Act, the chemical officers at Somerset House are only empowered to give a certificate of the *results* of their analyses, and are not asked for any expression of opinion, and hence I consider the gentlemen referred to are exceeding their duty in furnishing such reports as above.

I beg also to draw attention to the absurdity of the clause as to the amount of fat, when contrasted with the after opinion that the milk is adulterated, and it is time that the attention of the Government should be drawn to the manner in which the Act is rendered inoperative by their officials, both by their peculiar views on the subject of Analyses, and by the issue of certificates framed in such an ambiguous manner that a magistrate, after reading them, feels bound to dismiss a summons, even though the Milk is expressly stated to have been adulterated.

I am, Sir, yours &c.,

E. L. CLEAVER,

Public Analyst to the Parish of St. Mary Abbott, Kensington.

318, King's Road,
Chelsea, S.W.

To the Editor of "The Analyst."

Sir,—I shall be glad if you can inform me where I can find a reprint of the Lecture delivered by Mr. James Bell, of the Somerset House Laboratory, some years ago, before the Chemical Society, on the Adulteration of Food.

Yours &c.,

A PUBLIC ANALYST.

Feb. 22, 1878.

[We suppose the Lecture referred to was the one stated in the *Journal of the Chemical Society*, Vol. 11, new Series, page 1197, to have been delivered on the 19th February, 1874, but we cannot succeed in finding any reprint or abstract of it.—Editors Analyst.]

LAW REPORTS.

To the Prejudice of the Purchaser.—A remarkable prosecution, under the provisions of the Sale of Food Act, has been decided at Southampton. Mr. W. Gibbons, of Netley, was summoned for selling adulterated rum, to the prejudice of the purchaser. A police constable named Palmer said he bought a pint and a quarter of the rum. Examined by the counsel for the defendant, he said he bought the rum for himself, but did not taste it, nor had he done so since. For the defendant it was urged that the information was wrong, inasmuch as it alleged distinctly that the witness was prejudiced by the sale, whereas according to his own admission he could not be prejudiced because he had never tasted the rum at all. Being asked, the witness said he did not know how he was "prejudiced" by purchasing the rum. He knew, however, that the rum was not good. Mr. Stannard proved the forwarding of a sample of spirits to Mr. Angell, the county analyst, who had since forwarded him a certificate showing that whilst genuine rum was sold from proof to 12 per cent. under, the rum in question had been reduced by the addition of water to 19·5 under proof. For the defendant it was submitted that he had been summoned under the wrong clause in the Act, viz., section 6, which applied to a private purchaser, instead of section 13, which applied to the purchase by an inspector in his official capacity. Clearly the actual purchaser in this case had not been, in the words of the summons, prejudiced, and it was submitted, therefore, that there was no case. The Bench said they believed the water had been added to the rum according to the custom prevalent, at any rate in that neighbourhood, and to accommodate the purchaser by selling the spirit at a reduced price. They could not come to the conclusion that any fraud had been committed against the purchaser, and therefore dismissed the case.—*Grocer.*

Adulteration of Beer at Peckham.—At Lambeth Police-court, on Friday, 1st. ult., Owen Hasters beer-house retailer, late of the George, St. George's road, Peckham, was summoned by the Vestry of Camberwell for selling beer which was not of the nature, substance, and quality of the article demanded. Mr. Marsden, the vestry clerk prosecuted, and Mr. Lilley defended. Mr. Marsden said the case was one of considerable public importance, and he proposed to call Dr. Bernays, Professor of Chemistry, who had given a certificate that the beer in question was adulterated to the extent of 96 grains per gallon. Mr. Lilley denied that any salt had been put into the porter. The defendant had been obliged to leave the house, and had lost £140 by the place. What he had done was to use liquorice and sugar, in order to satisfy the taste of his customers. Dr. Bernays, in his evidence, said there was salt in sugar, which might now account for the statement made by Mr. Lilley, and the more common the sugar the more the salt. The beer in this and other cases promoted instead of quenching thirst. Mr. Ellison said the case had been much altered by the evidence of Dr. Bernays that sugar contained salt, or he should have inflicted the highest penalty. He imposed a fine of 20s. and 12s. 6d. costs.

Heavy Penalties for Milk Adulteration.—At Southport, William Wright, a farmer, of Crossens, was fined £10 and costs for having sold milk adulterated to the extent of 9·5 per cent. John Rimmer, farmer, of Marshside, was assessed in the like penalty for a similar offence, the dilution being certified by the analyst to amount in this instance to 11·5 per cent. George Aylesbury, proprietor of the Royal Hotel, and contractor for the sale of refreshments at the Botanic Gardens, Churchtown, for having the milk he was vending at the latter place, slightly adulterated with water, and almost without cream, was fined £5 and costs.

At Macclesfield, Jane Sharpley was fined £3 and costs, or two months' imprisonment with hard labour, for selling flour adulterated with 58 grains of alum to the 4lb. loaf. It was described as the worst case brought in any Court under the Food and Drugs Adulteration Act.

At Greenwich, Joseph Samuel Doust, of the British Queen, Billingsgate Street, Greenwich, appeared to a summons, at the instance of the Greenwich District Board of Works, charging him with selling adulterated gin. The evidence showed that on the 13th of November, Mr. Corden, an Inspector in the service of the Board, purchased a half-pint of gin, retailed at 5d. per quartern, at the defendant's house. The certificate of the Analyst, Mr. G. W. Wigner, set forth that the gin was nearly 40 per cent. under proof. The gin had been adulterated with water, not with anything deleterious. Mr. W. Andrews of the Henry VIII., Foreign Cattle Market, Deptford, was called, and said he had been in business as a licensed victualler 30 years. He said that gin was generally supplied to the trade at 17 to 22 per cent. under proof, and that the 17 per cent. was diluted with sugar to 22 per cent., which was then what was termed "Old Tom," and sold at 6d. per quartern, the 22 per cent. under proof having water added and being sold at 5d. per quartern. The 4d. gin he sold was as near as possible that which had been analysed. The price of gin was generally from 12s. to 12s. 6d. per gallon in the market. The defendant was fined 20s. and costs.—*Times*.

In another case at Greenwich, a summons for selling gin at 4d. per quartern, 38 under proof, was dismissed on the ground that it was proved by evidence that this was the usual strength of 4d. gin in that district. Mr. Poulter, in opening the case for the defence, raised a preliminary objection that the charge was for selling gin "to the prejudice of the purchaser," and contended that the inspector, having acted officially, was not prejudiced by his purchase. Mr. Balguy, the magistrate—Then you would make the officer useless altogether, unless set in motion by the purchaser. I cannot allow the objection.

Mrs. Maria Tuck, wife of a farmer residing at South Tawton, was fined 20s. and costs by the Exeter magistrates on Thursday for selling adulterated butter. According to the certificate of the city analyst, the article contained at least 20 per cent. of fatty matter, which might have been either dripping or lard. As we stated a week or two since, short-weighted butter is frequently found in Exeter Market by the inspector, but if the farmers' wives are going to adulterate as well as to curtail the legal weight of their butter, Exeter provision dealers will do well to be very cautious in purchasing country supplies of this article.—*Grocer*.

At Bromsgrove Public Office, before Sir R. Harington and Mr. R. Smallwood, was decided a case which has excited a large amount of attention in the district. On the 11th ultimo charges under the Sale of Food and Drugs' Act, preferred by Superintendent Tyler, were heard at the same place, by the same magistrates, against several milk sellers. One was convicted and fined £2 and costs; three cases were withdrawn, the result of the analysis by Dr. Swete, of Worcester, showing the amount of fat in each to be very near the standard. In the other case, against Thomas Fisher, Dr. Swete's analysis showed the milk to contain 11.22 per cent. of solids not fat, and only 1.76 of fat. The defendant was ably defended by Mr. Buller, of Birmingham, who called Mr. Alfred Bostock Hill, of Birmingham, who stated that he had analysed a sample of milk (sworn to be the portion of defendant's milk handed back to him at the time of purchase by Superintendent Tyler, in accordance with the Act), and he found it to contain 9.22 per cent. of solids not fat and 3.47 of fat. In this conflict of scientific evidence, it was decided to send the third portion of the milk sample in the possession of the police to Somerset House, for analysis by the Government analyst, and the case was adjourned till yesterday, for the result to be ascertained. Yesterday Sir R. Harington stated that the analysis showed as follows:—Solids not fat, 9.00 per cent.; fat, 3.55; water, 87.45, and the analysts (Messrs. J. Bell, R. Bannister, and G. Lewin) gave it as their opinion, from the consideration of the result of the analysis, that the milk was genuine. Sir R. Harington said the analysis showed that there must have been a mistake somewhere, as practically it showed the milk to be genuine, and they must, therefore, dismiss the case; but as they thought it rather hard on defendant to bear all the expenses of the mistake, they had decided to allow one guinea costs. Defendant afterwards applied for other costs, but this was not granted. Defendant said he should not accept the costs allowed before taking a legal opinion.—*Birmingham Daily Post*, February 14th, 1878.

Mr. J. W. Thomas, Public Analyst for the Borough of Cardiff, has been appointed Public Analyst for the Borough of Newport, Mon.

A new and simple method is reported from Berlin of testing the purity of water by electricity. The more the water is charged with foreign matter, the more does it resist the passage of the electric current, and *vice versa*. Could not our native chemists devise a version or versions of this aqueous experiment that would admit of application to all the liquid merchandise of refreshment rooms?—*Western Daily Press*.

FURTHER NOTES FOR BEER DRINKERS.—Professor Galloway, of the Irish College of Science, writes to the Dublin papers, to say that his attention has been directed to an advertisement which appeared in one of the journals devoted to the brewing trade, of a bitter as a substitute for hops. He procured a sample of this bitter, but there was great difficulty in obtaining it, as the vendors were careful to whom they supplied it. It was found to be picric acid, mixed with a little colouring matter.—*Medical Examiner*.

GLYCERINE IN BEER.—It appears that beer is adulterated to a great extent with glycerine in Germany. An easy and exact method of its determination in this connection is wanting, and a prize of 3,000 marks has been offered by the *Verein für deutschen Gewerbfleiss* for the best solution of this problem. —*County Brewers' Gazette*.

FAVERSHAM.—The Town Council having received another letter from the Local Government Board, asking their reason for not appointing a Public Analyst, have, after due discussion and deliberation, decided to send a reply to the effect that, "the Council do not consider it necessary to do so." The Board have lately exhibited commendable activity in endeavouring to induce the appointment of Public Analysts throughout the kingdom, and there appears a strong indication of their intention to put the law in operation against all defaulting authorities.—*Lancet*, Feb. 2nd, 1878.

FAVERSHAM, AT LAST!—At a meeting of the Faversham Town Council, a third letter was read from the Local Government Board on the subject of appointing a public analyst for the borough under the Sale of Food and Drugs Act. It stated that the Board had considered the representations made by the Council, but saw no reason why the benefits of the Act should not be extended to Faversham, and therefore the Council was again urged to appoint an analyst. It was decided by seven votes against three to rescind the former resolution, and to make the appointment.—*Times*, Feb. 26th, 1878.

RUSSIAN ATROCITY—The Russians are a remarkable people. If there be any truth in the following statement, the Russian soldier must certainly be credited with powers of digestion not enjoyed by the armies of other nations. An Austrian Military paper, the *Vedette*, asserts that some bread of the same kind as that issued to the Russian troops in Bulgaria was recently obtained and examined by the Military Intendance in Vienna. A careful analysis showed that the bread contained 19 per cent. of sawdust and 14 per cent. of sand! We should like to know what the other ingredients were.—*Grocer*.

RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1877. No.	Name of Patentee.	Title of Patent.	Price.
2288	J. Holden and S. Turton	Receptacles for Acids	2d.
e420	A. Colson	Manufacture of Gas	6d.
2476	R. W. Wallace and C. F. Claus	Purification of Gas	4d.
2488	F. D. Marshall	Manufacture of Gas	6d.
2579	P. & F. M. Spence	Manufacture of Alum, &c.	6d.
2612	Ditto	Ditto	2d.
2594	H. McDrummond & J. A. W. Donald	Manufacture of Chromates	2d.
2635	F. B. Doering	Medicated Wools	2d.
2663	M. Welton	Preserving Meat	2d.
2687	E. Solvay	Treatment of Bicarbonate of Soda	6d.
2708	H. Gardner	Pyrometer or Thermometrical Indicator	6d.
2720	G. Lund	Apparatus for Synchronizing Clocks	6d.
2736	G. W. Von Nawrocki	Treating Fœcal Matters for Production of Manure	4d.
2753	F. W. Haddan	Apparatus for Burning Hydrocarbons	2d.
4443	W. E. Nickerson	Sour Tannin Solutions for Plumping Hides	2d.

The Index to Vol. 2 will be published with our next number. Price to non-subscribers, 3d.; to subscribers, free.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Medical Record; The Miller; The Anti-Adulteration Review; Journal of Applied Science; The Country Brewers' Gazette.

THE ANALYST.

Two years ago, when The Analyst first appeared, there were not a few prophets who predicted that a small society, such as the Society of Public Analysts must ever be, could not maintain a monthly journal of its own. Such views naturally received ready credence from those who, because they were not actually analysts in practice, were not eligible to be become members of the society. The appearance of our twenty-fifth number, commencing our third volume, will go far to disabuse the minds of those who still cherish such an opinion.

The object laid down in the first number of The Analyst was not only to print all papers read before the Society but to supply such information on technical points, both of general analysis and food analysis, as should meet the requirements of the ordinary analyst, and to furnish reports of such typical cases of adulteration proceedings, and other law cases in which chemical points were involved, as should furnish a permanent record for reference.

When at the end of the first year a difficulty arose in consequence of a society which is not chartered, being the owner of a copyright, a slight alteration was made to meet this difficulty, and the journal having passed into the hands of its present proprietors, a new feature was added in the form of editorial articles and notes on the questions which from time to time disturb even the quietude of laboratories. How far we have succeeded in our task must be for our readers to judge. We can only form our opinion from our increased and increasing circulation, and from the fact that nearly every technical journal quotes from our pages.

One feature of the present number, which will doubtless be examined with interest, is our annual return of the work done under the Sale of Food and Drugs' Act. We have not space to refer to this fully this month, but in our next number we shall make a comparative analysis of the results of the last and previous years.

The past year has been marked in the chemical world by the formation of the Institute of Chemistry. This company has not been formed on the same basis as the Society of Public Analysts. To become a member of the latter society it is necessary that the applicant should be an analyst in practice, even assistants not being eligible, whereas to become a member of the Institute it has hitherto been simply necessary that the council should "admit" the would-be member, as the qualification clauses are only to be enforced in the future. The Council have exercised this right to admit freely, and our readers will judge how far the criticisms we have considered it our duty to publish on the scheme were well founded, when we point out that nearly one half of those whom they have admitted have not accepted the proffered honour and "liability." Evidently, therefore, the mode of organization adopted did not commend itself to many of the elected five hundred, any more than to our correspondents and ourselves.

One word more. Opinions are expressed in certain legal circles that the company does not really fall within the scope of the Companies' Act; if this is the case what is the penalty, surely there must be some? The answer a correspondent gives is, "*Unlimited liability*," which is not a very pleasant outlook for the shareholders, especially if every member is a shareholder.

A very unseemly difference has occurred during the year between the Public Analysts and the chemists in the Inland Revenue Laboratory. Differences of samples may of course be expected to occur occasionally, and then, if a sample has been changed either wilfully or by accident, an analyst must be expected to find different results. The matter becomes much more sericus when the results obtained are identical, but the deductions drawn from these results are different, when, in fact, chemists put on one side the accumulated experience of years, and work on new data. Still more is there ground for regret when the application of our Society for the publication of those data in the only effectual way is refused.

As to the original papers which have been published in the last year, our index must speak. We shall endeavour to keep up to and even excel our present standard in the coming year, and to this end shall gladly receive any contribution containing the results of original research on any chemical subject.

SOCIETY OF PUBLIC ANALYSTS.

A General Meeting was held at Burlington House, Piccadilly, on the 20th March, the President, Dr. Dupré, F.R.S., in the chair.

The minutes of the previous meeting were read and confirmed.

Dr. Muter and Mr. Hehner were appointed scrutineers to examine the voting papers, and they reported that the following gentlemen had been elected, viz., Dr. S. T. Rowe M.P.S.G.B., Redruth; Mr. J. West Knights, Cambridge; Mr. H. Goode, M.B. and M.R.C.S., Derby; and Mr. H. P. Harris, Rotherham.

Mr. R. E. Owen, of Beaumaris, public analyst for Anglesey, was proposed as a member, and will be ballotted for at the next meeting.

The Secretary read a paper by Mr. Wynter Blyth "On the Amendment of the Sale of Food and Drugs' Act."

The Secretary also read a paper by Messrs. A. H. Allen and R. Bodmer "On Experiments on the Determination of the Free Acids of Vinegar."

The next meeting of the Society of Public Analysts will be held on Wednesday, May 1st, at Burlington House, Piccadilly.

ON THE FATTY METAMORPHOSIS OF THE ALBUMINOIDS IN MILK AND CHEESE.

By A. Wynter Blyth, M.R.C.S.

Read before the Society of Public Analysts, on 20th February, 1878.

In 1864, M. Ch. Blondeau contributed to the Annales de Chémie et de Phy
Serie. t. 1) his research on the changes which the Roquefort
probably from the influence of mycoderms.

A portion of a typical cheese was taken and divided i
was analysed at once, the three others were replaced in cellar
month, two months, and a year's respective sojourn.

(1.) The fresh cheese had the following composition:—

Caseine	81·03
Chloride of sodium	4·40
Fat	1·85
Lactic acid	0·88
Water	11·84

(2.) The piece which had remained in the cellars a month had all the appearance of a fatty body; its odour had changed, and its taste was sweet and agreeable. The analysis shows that a large portion of the caseine had undergone fatty change.

Caseine	61·33
Fat	16·12
Chloride of sodium	4·40
Water	18·15

(3.) The piece which had remained in the cellar two months was exactly in the condition most prized. There was a still further development of fat, and the fat itself had become partially decomposed into fatty acid.

Caseine			43·28
Fat	Margarine	18·30	32·30
	Oleine	14·00	
Butyric acid			0·67
Chloride of sodium			4·45
Water			19·30

(4.) The fourth portion, kept a year, had acquired a strong odour and a pungent taste. Ammoniacal salts of the fatty acids were formed, and there was a still further diminution of the caseine and an increase of fatty products.

Caseine	40·28
Margarine	16·85
Oleine	1·48
Butyrate of ammonia	5·62
Caproate of ammonia	7·31
Caprylate of „	4·18
Caprate of „	4·21
Chloride of sodium	4·45
Water	15·62

This research appears to have attracted but little notice, yet, despite of its incompleteness, I cannot but consider it as a path-breaking one, and likely to be of considerable and practical interest to those engaged in the examination of foods.

I have analysed a large number of cheeses, in order to follow up a similar line of investigation, the time has, however, not yet elapsed for their re-analysis, and I therefore shall confine my remarks to the analagous change taking place in milk.

That there is really an increase of fat in decomposed milk, I believe can be established not alone from experiments or analyses undertaken with the special object in view of investigating the question, but also from what may be called accidental experiments.

(1.) A sample of "fore" milk, which in its time was rather notorious, was analysed by the writer on July 17th:—

Solids not fat	9·70
Fat	·20
Ash	·71

Circumstances arose rendering an analysis by another chemist desirable. It was submitted to Mr. Wigner, who found about three weeks afterwards—

Solids not fat	8·96
Fat	·76
Ash	·74

Free acidity calculated as Lactic Acid, 73 per cent.

(2.) Almost every sample of milk which has been analysed by a *second* chemist, on record in the pages of the *Analyst*, shows an increase of fat. Thus a milk analysed by Dr. C. Brown * on the 28th of April, gave but 2·68 per cent. of fat, the same milk on May 9th, 2·98 per cent. of fat; and the same milk, analysed by Mr. Wm. Thompson, on May 15th, gave 3·017 per cent.

A milk analysed by Dr. Hill,† gave, on the 1st of March, 2·47 of fat, the same sample was returned by the Inland Revenue chemists, on the 20th of March, as containing 2·83 per cent. of fat.

(3.) The writer analysed, very carefully, two samples of milk from Stonehouse, on the 20th December, 1877. Each milk was analysed twice, and there was a close agreement between the analyses.

		Dec. 20, 1877.
(1.)	Caseine and milk sugar	8·19
	Fat	2·09
	Ash	·62
	Solids not fat...	8·81
(2.)	Caseine and milk sugar	8·46
	Fat	1·33
	Ash	·65
	Solids not fat...	9·11

The one was certified deficient in cream, and adulterated with water, the second deficient in cream only, and both were submitted to Somerset House; No. 1 alone reaching their laboratory; No. 2 bursting the bottle. The Inland Revenue chemists found, (analysed probably between 4th and 8th of January, 1878),

(1)	Solids, not fat	7·84
	Fat	3·38
	Ash	·68

And they certified that there had been no abstraction of cream, but a small addition of water.

On examining the second sample, that is the one which through mis-fortune did not reach Somerset House, and which on the 20th of December, gave only 1·33 per cent. of fat. I found on the 23rd of January its composition, as follows:—

(2)	Solids, not fat	7·62
	Fat	1·79
	Ash	·66

Acidity calculated as lactic acid ·507 per cent.†

Further, the No. 1 milk which yielded to me on the 20th December, 2·09 per cent. of fat, and to the Government chemists on the first week of January, 3·30 per cent. of fat, on examining it on the 23rd of January, I found 3·919, or nearly 4 per cent. of fat, therefore there can be no reasonable doubt that in this particular sample of milk in about a month the fat nearly doubled in amount.

* *Analyst*, No. 18, Sep., 1877.

† It is almost unnecessary to state that the lactic acid was neutralized before extracting with ether.

I now come to a few analyses made specially to trace the changes in decomposed milk.

(1.) A milk analysed on the 24th January :—

Sp. G.	1032·1
Fat	3·52
Milk sugar	4·88
Albuminoids	4·25
Ash	·72

The same sample was divided into two parts—the one was put in a perfectly clean bottle, the other was contaminated with a droplet of the No. 1 Stonehouse milk before spoken of.

The uncontaminated milk 21 days after gave 3·41 per cent. of fat, 3·00 of milk sugar, ·009 per cent. of acetic acid, ·126 per cent. of lactic acid, and ·0267 per cent. of alcohol, so that there was certainly no increase of fat, but some slight lactic fermentation, as evidenced by lactic acid, alcohol and oxidised alcohol.

The same milk which had been seeded with the ferment analysed at the same time, viz., 21 days afterwards, gave 3·9 per cent. of fat. Acetic acid, alcohol, lactic acid, and milk sugar were not estimated through accident.

(2.) A milk analysed January 27th gave the following results: —

Fat	2·584 per cent.
Milk sugar	4·566
Albuminoids	5·492
Ash	·720

The same milk 18 days afterwards gave

Fat	4· 09
Milk sugar	2· 75
Lactic acid	·119
Acetic acid	·002
Alcohol	·0145
Albuminoids (by difference)	3·100
Ash	.72

This milk had a creamy appearance, there is a marked increase in the fat.

(3.) A milk analysed by Mr. Wigner on the 3rd of Sept., 1878.

Total solids	11·56
Fat	1·74
Solids not fat	9·82

The same milk analysed by the writer about 5 months afterwards on Feb. 3rd, 1878.

Total solids	8· 37
Fat	1· 19
Milk sugar	2· 30
Alcohol	·009
Acetic acid	·013
Lactic acid	·351
Ammonia in combination	·070
Total nitrogen by combustion	· 69
Ash	· 71

In this case the fat was not increased but diminished. The whole of the volatile acids present are returned as acetic, a small portion of which was, however, butyric, or some other volatile fatty acid. The milk had an acetic ether odour.

(4.) Another milk analysed by Mr. Wigner on the 7th of Sept., 1877.

Total solids	10·615
Solids not fat...	8·015
Fat	2·600
Ash	·635
Chlorine	·061

The same milk analysed by the writer 5 months afterwards.

Total solids	9· 40
Fat	3· 89
Albuminoids	2· 00
Milk sugar	2· 31
Alcohol	·213
Lactic acid	·548
Acetic acid	·385
Ammonia in combination	·020
Total nitrogen by combustion	·313

Here, again, although the milk is the same age as the former sample, there is a very marked increase of fat. The milk had an odour of acetic ether—there were small quantities of one or more volatile fatty acids present.

(5.) A milk analysed by Mr. Wigner in November:—

Total solids	10·77
Solids not fat...	8· 5
Fat	2·62

The same milk analysed by the writer 2½ months after date:—

Total solids	7·52
Fat...	2·96
Solids not fat	4·56
Milk sugar	2.10
Albuminoids...	2·10
Lactic acid	·081
Ammonia in combination	·012
Total nitrogen by combustion	·337

Alcohol not estimated.

In this case there was a considerable development of acetic acid, the odour of acetic ether was very powerful, and the fat is slightly increased.

The method of analysis it is, perhaps, right to mention. The fat was weighed directly, and dissolved out by ether from the solids, first made perfectly neutral by sodic carbonate, the milk sugar was converted into grape, and determined by copper solution, the precipitated sub-oxide being dissolved in acid, and deposited as copper by electrolysis on platinum foil, and then weighed.

The alcohol was obtained by re-distilling the distillate, and subsequently oxidising into acetic acid, as in the method recommended by Dr. Dupré.

The volatile acid returned as acetic was principally, but not entirely, that acid.

The alcohol calculated as ethylic was also probably a mixture of other alcohols.

The other determinations require neither comment nor explanation.

As we all know what is usually called the caseine of milk is really four albuminoid bodies, viz., true caseine, albumin, lactoprotein, and nuclein. The last was, I think, discovered in milk by Lubavin, and is in very small quantity. What share the albumin and the caseine take in the production of fat remains an interesting subject for investigation, and also what other bodies are formed. In the course of these few experiments I have found that

in decomposed milks nearly the whole of the nitrogen they contain may be obtained by first distillation with sodic carbonate and then with alkaline permanganate, and not as would be the case were the structure of the caseine and albumin unaltered a fractional part only.

I would also point out that the fatty degeneration of muscular fibre one so often observes in dissecting rooms, the formation of adipocere, and the drops of oil appearing with more or less rapidity in the nuclei or bioplasm of animal cells, are examples of the fatty transformation of albuminous and fibrinous substances, which, so far as we know, are constructed on the same type as the milk albuminoids.

The bearing of this subject in the reference of samples to Somerset House is obvious, I believe by a very thorough examination of a decomposed milk, it will be possible even after five or six months to build up by calculation its original parts, but the subject requires much work, and I will therefore not commit myself to any definite opinion, but trust to make one or two communications on this subject at some future meeting of the Society.

NOTE ON AN INGENIOUS ADULTERATION OF MILK.

By Dr. J. Muter.

Read before the Society of Public Analysts, on the 20th February, 1878.

Some time ago I received a sample of milk which, on analysis, gave :—

Fat	2.1
Solids not fat	8.3
Total	10.4
Ash	.5

I was, however, struck by the very low ash, a somewhat unusually hygroscopic appearance about the residue, and a taste which indicated a much higher degree of dilution than that indicated by the above figures. I accordingly set to work to make a full analysis, which gave :—

Fat	2.10
Sugar (taken by Fehling)	2.70
Casein	3.35
Ash	.50
Total	8.65

Here, therefore, were only 6.55 true solids (not fat), showing, as I expected, a much larger quantity of water.

After numerous researches, I at last found that the foreign matter in the milk was glycerine, which is certainly a most ingenious addition, as a solution of that body in water of 12 per cent. strength has a specific gravity of 1.030; and I found, after several experiments, that 35 per cent. of such glycerine water might be added to milk without being detectable either by gravity or by the ordinary "solids not fat" process. Moreover, such an amount does not give any extraordinary sweetness easily detectable by the taste.

The following is the modification of Mr. Wanklyn's process, which I have devised to meet this case :—

(1.) Evaporate, as usual, and weigh the residue.

(2.) Extract the residue with *pure* anhydrous ether, and weigh the fat or the solids not fat whichever the operator may prefer.

(3.) Extract the solids not fat with a mixture of *absolute* alcohol and ether, in equal volumes, and evaporate the solution at a gentle heat. Any oily-looking liquid that is left should now be tested for glycerine, by warming with a little sulphuric acid, and getting off the fumes of acrolein. If this be found the solids not fat are perfectly unreliable, and nothing remains but to make a full analysis of the milk, estimating both the sugar and the casein directly—the former by Fehling's solution and the latter by precipitation. If the Fehling be used gravimetrically it should be borne in mind that the true equivalent, as shown in my manual of chemistry, is not that usually given, but is 100 parts milk-sugar = 147.76 parts CuO.

(4.) The ash must be taken on a separate portion.

In case the milk be sour it must be carefully neutralised by a known weight of sodium-carbonate before evaporating.

This difference between the true and the apparent solids not fat will indicate the amount of "glycerine-water" added, and if the gravity of the milk is about 1.030 it is then safe to call 12 per cent. of that glycerine and the rest water. Of course as the glycerine is slightly volatilised during the evaporation, the estimation will always be something under the truth.

EXPERIMENTS ON THE CHEMICAL ACTION OF CHLORATE OF POTASH ON THE SYSTEM.

By Otto Hehner, F.C.S.

Read before the Society of Public Analysts, on 20th February, 1878.

Chlorate of Potash was formerly frequently administered as a medicine with a view of supplying oxygen to the system in cases of defective oxydation. It was thought, doubtless, that since oxygen is readily obtained from it by the action of heat, it must undergo similar decomposition in the animal body. But after some investigations of Wöhler and Stehberger, who recognized chlorate of potash in the urine of patients who had taken it, this opinion was abandoned as altogether erroneous, and in all books on Pharmaceutical Chemistry and Materia Medica the statement is now to be found that chlorate of potash passes through the system without any decomposition. But this statement, true though it may be, seems at least to be based on very slender evidence; the mere "recognizing" in the urine of the salt cannot be considered conclusive as to the inertness of the compound. And since chlorate of potash, besides being a powerful diuretic, undoubtedly possesses other valuable medicinal properties, I have, at the request of Dr. Sinclair Coghill, of Ventnor, undertaken a series of experiments with a view to arrive at a definite conclusion. Whilst I have thus worked at the chemical side of the question, Dr. Coghill has investigated the medical part, and his results will be published in a medical paper.

Since the works on Analytical Chemistry did not supply me with any information as to any method for the quantitative determination of chlorate of potash in a liquid like urine, in the presence of much chloride and organic matter, I will embody in this paper the description of the several methods which I have used.

In the three series of experiments, which I am about to describe, three different methods of analysis were employed.

In the first the chlorine present as chloride was determined by means of a standard silver solution (1 c.c. = 0.00355 grm. Cl) after the organic matter had, as far as

possible, been destroyed by means of a solution of permanganate of potash, the dioxyde of manganese which had copiously come down, having been removed by filtration and thoroughly washed with boiling water. In another quantity of the urine the total chlorine was determined volumetrically after incinerating the urine with the addition of a little nitrate of potash, dissolving the white mass in water, acidulating slightly with nitric acid and neutralizing the acid by the addition of pure carbonate of lime. The difference between the two determinations was calculated for $K\,Cl\,O_3$.

Although on testing this method by analyzing a urine to which a known quantity of $K\,Cl\,O_3$ had been added, I obtained very fair results, yet I abandoned it, in the second series, for two reasons. First, because on incineration a little chloride may be volatilized; and, second, because some chlorate may escape perfect decomposition.

In the second series of experiments I employed, as a reducing agent, the copper-zinc couple described by Messrs. Gladstone and Tribe. This useful couple is prepared by pouring over 1 metre of well-crumpled very thin zinc foil cut in shreds, a solution of 15 grms. of sulphate of copper, the resulting black spongy mass being well washed with water. It decomposes water even at ordinary temperature with the evolution of hydrogen, whilst near the boiling point the reaction is exceedingly active. It readily reduces chlorate of potash in solution, as has been shown by Thorpe and by Gladstone and Tribe, and is more clearly seen from the following experiments:—

Twenty-five c.c. of a solution containing 0.25 grm. $K\,Cl\,O_3$ were boiled for five minutes with a quantity of the couple, the liquid was filtered, the precipitate washed with boiling water, and the chlorine titrated by means of standard silver solution. Used 5.10 c.c. equal to 0.0625 grm. $K\,Cl\,O_3$ or 25.00 per cent.

After ten minutes' boiling, 9.0 c.c. silver solution were used, equal to 0.1103 grm. $K\,Cl\,O_3$ or 44.12 per cent.

After twenty minutes, 14.9 c.c. = 0.1827 grms. $K\,Cl\,O_3$ or 73.08 per cent.

After half-an-hour's boiling, 20.34 c.c. of silver solution were used, corresponding to 0.2494 grms. $K\,Cl\,O_3$ or 99.76 per cent. of the total amount taken.

Hence at boiling temperatures the reduction of chlorate in aqueous solutions by means of the couple is very rapid. At ordinary temperatures, however, the reduction is slow. Thus allowing 25 c.c. of chlorate solution to stand over night with a considerable quantity of the couple, only 4.4 c.c. of standard silver solution were used, equal to 0.0539 grms. $K\,Cl\,O_3$ or no more than 21.56 per cent. of the chlorate had been converted into chloride.

The reduction is also far slower in urine than in pure water. 25 c.c. of urine and 25 c.c. of the above chlorate solution were boiled for one hour with the couple, the total chlorine was then determined, and from it the amount of chloride contained in the urine was subtracted. Only about 50 per cent. of the chlorate taken were found to have been reduced. After 3 or 4 hours' boiling, however, the total amount of chlorate had been converted into chloride, the determinations coming to within 1 milligram of the quantity taken.

In these experiments the couple was added gradually so as always to have an active evolution of hydrogen from the liquid.

Although, however, the reduction of the chlorate was quite perfect, the method was found to be troublesome, on account of the persistent frothing of the urine, and its

liability to run over. Moreover, in the dilute liquids with which I had to deal the difference between the determinations of the chloride and of the total chlorine was often very small, and the slightest mistake was enormously multiplied in calculating from the small volume analysed to the total volume of urine voided. I therefore, in the last series of experiments made, employed a third, a gravimetrical and eminently satisfactory and simple method. I removed from a measured quantity of the urine the chlorine present as chloride, by means of an excess silver nitrate, rendered the filtrate acid with dilute sulphuric acid, and added metallic zinc. Chloride of silver was at once formed, but by the further action of the zinc this was reduced, leaving the fluid quite clear, into metallic silver, which was washed, first with water, then with dilute ammonia, and in the filtrate the hydrochloric acid was precipitated with silver nitrate, the precipitate being collected and weighed. The reduction is finished in about half-an-hour if the liquid be very gently warmed.

The reduction was also tried, after the removal of the chloride as above, by means of an acid solution of ferrous sulphate. On heating, the chlorate is readily converted into chloride and separates as chloride of silver. I found this method to be the best, simplest, and quickest qualitative test for chlorate, being far superior to the usual incineration method, where loss by volatilisation is very possible. The test, in fact, is quite as sensitive as that for chloride, and quite as simple. As I do not find it described in any test book I have consulted, I recommend it here most emphatically, and consider it the more useful in qualitative analysis, since at the same time the nitrates are indicated before heating the liquid.

I further investigated the Indigo method, but found, that however exact it is in aqueous solution it is not applicable to liquids containing large quantities of organic matter, such as urine.

I now proceed to the experiments themselves.

I. SERIES. An inmate of the Ventnor hospital took on six successive days, in four portions daily, doses of 120 grains (or 7.776 grms.) or 720 grains in all of chlorate of potash. The urine was collected, the daily quantity measured and sampled The following results are calculated for each day's volume:—

1st day.—Excreted 7.27 grm. total chlorine, and 6.20 grm. as chloride; difference, 1·07 grm. Cl as chlorate, equal to 3.69 grm. $K\,Cl\,O_3$ or 47.5 per cent. of the daily dose.

2nd day.—7.64 total Cl, 5.34 as chloride = 2.30 Cl as chlorate equal to 7.94 grm. $K\,Cl\,O_3$ or 102.1 per cent. of a dose.

3rd day.—7.418 total Cl, 4.772 as chloride = 2.646 Cl as chlorate, or 9.138 grm. $K\,Cl\,O_3$ or 117.5 per cent.

4th day.—6.16 grm. total Cl, 4.25 as chloride, or 1.91 as chlorate, equal to 6.59 grm. $K\,Cl\,O_3$ or 84.8 per cent.

5th day.—Total Cl 8.84 grm., 5.79 as chloride; difference, 3.05 as chlorate or 10.53 grm. $K\,Cl\,O_3$ = 135.4 per cent.

6th day.—Total Cl 3.27, as chloride 3.05; difference, 0.22 Cl = 0.76 grm. $K\,Cl\,O_3$ = 9.7 per cent.

7th day.—Total Cl 4.45 grm., as chloride, 4.47 grm. therefore chlorate absent.

Obtained therefore altogether 497.0 per cent., of the daily dose, or 82.8 per cent. of the total chlorate taken.

"	Lambeth	16	4	2	—	44	2	—	—	15	3	49	4	24	—	150	13	
"	Newington	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
"	Rotherhithe	18	4	17	11	2	1	—	—	3		—	—	—	—	40	17	
"	St. George's, Southwark	10	3	6	1	—	—	—	—	4		4	—	2	1	26	6	1 water very dangerous.
"	Wandsworth	67	6	19	—	162	—	2	—	40		65	—	50	16	405	24	10 peas contained copper.
C. O'Keefe	Cork	144	7	—	—	—	—	1	1	1	—	2	—	60	14	198	22	Sundries all waters; 14 impure.
J. Pattinson	Newcastle-on-Tyne	45	6	4	—	29	3	—	—	8	2	52	9	22	9	160	27	Adulterated sundries all green peas and beans.
"	Northumberland	10	—	—	—	14	—	—	—	132	92	26	4	2	—	184	96	
"	South Shields	5	2	—	—	2	—	—	—	4	3	—	—	—	—	11	5	
C. H. Piesse	The Strand	58	7	20	—	109	1	6	2	—	—	17	—	56	10	266	20	9 peas were all coppered.
W. Procter	Beverley	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
E. Sergeant	Bolton	26	12	6	2	4	—	—	—	—	—	9	1	10	3	55	18	
J. Shea	Reading	24	—	3	—	18	—	—	—	17	3	2	—	—	—	64	3	
A. W. Smith	Rye	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
T. Stevenson	Bedfordshire	4	2	28	—	98	7	—	—	30	1	66	2	18	2	244	14	
"	Reigate	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2 quarters only.
"	St. Pancras	54	25	17	1	26	5	9	9	24	8	27	3	13	—	170	51	Drugs were all cream of tartar.
"	Surrey	104	21	40	—	230	12	1	1	55	24	11	2	14	1	455	61	
W. W. Stoddart	Bristol	185	32	7	3	22	1	—	—	9	5	4	—	2	1	187	46	
"	Somersetshire	100	7	55	5	540	72	4	—	95	20	16	—	4	—	814	104	
F. Sutton	Norfolk	2	—	—	—	2	—	—	—	—	—	3	—	—	—	7	—	
"	Yarmouth	8	4	—	—	—	—	—	—	—	—	—	—	—	—	8	4	
J. W. Thomas	Cardiff	35	—	16	1	48	8	22	8	18	14	12	—	14	—	165	31	
J. W. Tripe	Hackney	51	16	3	1	45	3	11	—	—	—	—	—	10	10	120	30	Sundries were all impure pump waters, and pumps subsequently closed.
W. Wallace	Ayr	3	3	—	—	—	—	1	—	—	—	—	—	—	—	4	3	A whisky was 22 *over* proof.
Wallace, Tatlock, and Clark	Glasgow	26	5	13	12	23	9	11	2	19	4	4	2	11	7	107	..	
"	Johnstone	2	—	2	—	—	—	—	—	2	—	—	—	—	—	6	—	
"	Kilmarnock	14	7	—	—	—	—	—	—	—	—	—	—	—	—	14	7	
"	Lanark	26	6	—	—	—	—	—	—	—	—	—	—	—	—	26	6	
"	Rutherglen	2	—	2	—	—	—	—	—	3	—	—	—	—	—	7	—	
"	Sutherlandshire	—	—	—	—	—	—	—	—	20	—	—	—	—	—	20	—	3 samples were 1, 7 and 10 *over* proof.
J. Whitmore	St. Marylebone	49	9	12	4	44	4	—	—	8	6	13	8	10	—	50	31	3 quarters only.
J. Wiggin	Colchester and E. Suffolk	14	8	—	—	—	—	—	—	—	—	1	—	—	—	15	8	
G. W. Wigner	Greenwich and Deptford	18	6	25	1	21	—	10	1	16	2	8	—	25	—	123	10	
"	Plumpstead	23	4	24	2	56	2	—	—	14	4	10	—	17	1	144	13	
"	Woolwich	16	6	15	—	24	—	5	1	17	4	6	—	10	—	93	11	
		3171	829	681	85	2987	389	403	96	1331	626	1042	71	818	177	11943	2371	

On account of the great irregularities in the amounts of chlorate in the urine and also on account of the fact, that though six doses were measured out to the patient, yet chlorate was only found on six instead of on seven or eight days, I thought I had good reason to place but little reliance on the above series, and I felt certain that if accurate results were to be obtained, I must make *myself* the vehicle of the chlorate. I determined at the same time to ascertain the rate at which the excretion of the chlorate takes place.

II. Series. I took exactly 2 grms. of pure and dry chlorate, and separately collected and analysed every batch of urine passed. Every analysis was made twice, the average being taken for calculation. Already 1 hour 30 minutes after the taking of the dose I found 0.3446 grm. $K\ Cl\ O_3$ or 17.23 per cent. of the dose in the urine. After another 2 hours, 0.4724 grms. or another 23.62 per cent. were found. In the third batch, passed 2 hours later, 0.3217 $K\ Cl\ O_3$ or 16.08 per cent. of a dose were contained. In the fourth, passed after another 2 hours 55 minutes, I found 0.2182 grm. $K\ Cl\ O_3$ or 10.91 per cent. Next morning, 20 hours 25 minutes after the commencement of the experiment, 0.3002 grm. $K\ Cl\ O_3$ were found, or 15.01 of a dose In the sixth sample, in which, owing to an accident, I unfortunately could only make one, and that one a very doubtful analysis, passed 9 hours 15 minutes after the last sample, 0.2196 grm. $K\ Cl\ O_3$ were contained, equal to 10.98 per cent. The seventh sample was free from chlorate.

Altogether, therefore, of 2 grms. of chlorate taken 1.8764 grm., or 93.82 per cent. had passed through the kidneys.

The rate of excretion, calculated per hour, was therefore as follows:—

1st experiment.—Per hour for 1½ hours ..	...	11.49 per cent.
2nd " " " 2 " ...	...	11.81 "
3rd " " " 2 " ...	...	8.04 "
4th " " " 2 "	55 minutes	3.74 "
5th " " " 12 "	...	1.25 "
6th " " " 9 "	15 minutes	1.18 "

The latter figure is, I believe, a little too high. 2 grms., though a somewhat large dose, is rather a small quantity, considering that it has to be determined in a very large bulk of fluid. The results must therefore necessarily be a little doubtful. Yet it is satisfactory, to get out of the whole body 1.8764 grms., with the loss of no more than 0.12 grm.

III. Series. I therefore took, within 2 hours or so, 8 grms. of pure chlorate of potash, and carefully collected all urine passed for nearly 3 days, namely, until a qualitative test for chlorate gave a negative result. The amount collected was nearly 4 litres. I mixed the different portions and made up with distilled water to 4000 c.c. From 40 c.c. the chlorides were removed as described in an earlier part of this paper, and the chlorate reduced with zinc and sulphuric acid; 0.0884 grms. AgCl were obtained. A second experiment also yielded 0.0884 AgCl, corresponding to 0.07552 grm. $K\ Cl\ O_3$, or 7.552 in the total volume. 94.40 per cent. of the chlorate taken have therefore been excreted by the kidneys in an unaltered state.

Whether the remaining six per cent. were decomposed in the body—were evacuated with the fœces, or were only very gradually and imperceptibly eliminated, I am unable to decide. My impression is that they were *not* decomposed, because if such reduction

took place, it ought to have been proportionately much greater in the case of the small dose than in the large dose taken.

The saliva turns intensely acid whilst chlorate remains in the system. The acidity is, however, *not* due to free hydrochloric acid.

Urine containing chlorate remains free from smell for a considerable period, although bacteria develop very plentifully in it. This fact bears out a statement of Royle and Headland in their Materia Medica, p. 96, namely, that chlorate was "supposed to counteract putrescence of the fluids in scarlatina, typhus, cholera, &c."

ON THE DETERMINATION OF SULPHURIC ACID IN URINE.

By E. Baumann.

Translated from the Zeitschrift für Physiologische Chemie, vol. 1, *page* 7.

I have already called attention to the occurrence and origin of numerous compounds found in the animal body, which have the common property of being split up into sulphuric acid and aromatic compounds on treatment with mineral acids.

They originate in the animal body from preformed sulphuric acid, so that they must not be looked upon as a separation of the sulphur but of the sulphuric acid.

The method which has been usually adopted for the determination of the ever-present (in normal urine) sulphuric ethers, viz., precipitation of the hydrochloric acidified urine with barium chloride, does not give correct information respecting the amount of sulphates present, and it is necessary to apply a correction to the statements hitherto made as to the amount of sulphuric acid in urine.

Having produced several of the above-named substances in a pure condition, and after their properties and chemical constitution are well known, I do not consider it superfluous to fix upon a simple method of determining the sulphuric acid and the copulated sulphuric acid in urine.

None of the copulated sulphates hitherto found in urine are decomposed by gently heating with dilute acetic acid for one hour; but they are entirely split up when warmed for a few minutes with the smallest quantity of hydrochloric acid, or if left for some hours without warming; therefore the salts present, as sulphates in urine, can only be determined by acidifying with acetic acid.

25 or 50 c.c. urine are treated with acetic acid, an equal volume of water is added, together with an excess of barium chloride. The whole is heated in a water bath until precipitation is complete and the supernatant liquid clear. This takes about half to three-quarters of an hour. The filtered precipitate gives the amount of sulphuric acid present as salts.

The filtrate is treated with dilute hydrochloric acid and warmed until the precipitate, which is formed, has completely separated. (I have formerly left it to stand for one hour in a warm place, in order to ensure decomposition of the copulated sulphates.) This second precipitate contains, along with barium sulphate, a brown resinous substance, of which the greater portion can be removed by washing with hot alcohol. From the weight of this second precipitate the amount of copulated sulphuric acid can be calculated.

A DANGEROUS COSMETIC.

By Charles H. Piesse, F.C.S.

I recently had submitted to me for analysis a small quantity of a white substance, in the condition of a magma, and I was informed in reference to it that it was used by an American lady as a face cosmetic. The lady, unable to purchase the preparation in London, desired to have some manufactured especially. The result of my examination showed that the substance consisted wholly of *calomel*, the wetness of the magma being due simply to water.

It is needless to add that on my representations the persons to whom the manufacture had been entrusted declined to go any further in the matter, while the existence of such a cosmetic in the American market is another instance of the 'cuteness of the Yankee,—regardless of consequences.

BUTTER ANALYSIS.

By F. P. Perkins, Public Analyst for Exeter.

I have lately been making experiments with butter fat, and I find that the volatile acids may be estimated very fairly in the following way. I give the "modus operandi" in full. From 3 to 4 grammes of the purified fat are taken, saponified in the usual way and allowed to cool, dilute sulphuric acid is then added until the insoluble acids rise to the surface, the flask is allowed to stand for a time and the liquid when clear is passed through a weighed filter paper, warm water is poured into the flask, a rotatory motion is given, and the layer of acids, broken up into a thousand globules, well washed. Allowed again to cool the wash water is passed through the filter, this operation is repeated many times, using altogether about 300 or 400 c.c. of water. The insoluble acids are then brought on the filter, washed with warm water, dried at 110 C. and weighed. The filtrate containing the volatile acids is made up to 500 c.c. In 100 c.c. the acidity is determined with decinormal K Ho, another 100 c.c. are boiled until reduced in bulk to 10 c.c., water is added and the acidity again taken. By subtracting the figures of the second experiment from those of the first, and multiplying by 5, an estimate is obtained, expressed in cubic centimetres of K Ho of the acidity due to volatile acids. All that is now required is to translate this into Butyric acid and to calculate the percentage from the amount of butter used.

The following table shews the degree of accuracy with which the process can be worked :

Exp. 1. 4·387 grammes of butter fat taken. Solution of volatile acids made up to 500 c.c. Acidity due to volatile acids = 34·7 c.c. of decinormal sol. of soda = 6 9 p.c. butyric acid.

Exp. 2. 2·47 grammes of the same butter fat taken. 86·72 p.c. of insoluble acids obtained. Solution of volatile acids made up to 500 c.c. Acidity due to volatile acids = 19·5 c·c. of decinormal solution of soda = 6·9 p.c. butyric acid.

Exp. 3. 3·004 grammes of butter fat taken, giving 86·58 p.c. of insol. acids. Solution of volatile acids made up to 500 c.c. Acidity due to volatile acids = 21·9 c.c. of decinormal sol. of potash = 6·4 p.c. butyric acid.

Exp. 4. Another portion of the same sol. Acidity due to volatile acids = 20·8 decinormal sol. of potash = 6·1 p.c. butyric acid.

Exp. 5. 2·3 grammes of beef fat taken. Filtrate from insol. acids made up to 500 c.c. Acidity due to volatile acids = 4·4 c.c. decinormal sol. of potash = 1·6 butyric acid.

The butter used in these experiments was pure Devonshire.

It appears to me that thus simply butter may be shown to be adulterated or not, if the volatile acids do not come up to a fixed standard.

REVIEWS.

The London Water Supply, by Dr. Meymott Tidy*.

An Examination of the Figures and Statements published as the Results of the Analyses of Professor Frankland on the London Water Supply in 1876 and 1877, by Ω†.

Dr. Tidy's volume is not merely his annual report to the Society of Medical Officers of Health, but it is a most elaborate and carefully prepared tabulated statement of the results of the monthly analyses of the London Waters, made by Dr. Letheby and Dr. Tidy, during the last ten years, together with many valuable remarks on the sources of supply of the different companies, and the variations in the character of the Waters.

The main object which the author has had in view has been to furnish a comprehensive book of reference, to enable a fair judgment to be formed on the schemes now before Parliament, for changing the character of the Water Supply of London. With this end in view, he very rightly denounces the extravagant pictures of river pollution, which are from time to time drawn, and endeavours to reduce the whole matter to a more common sense point of view.

As far as his book goes, we think he has acquitted himself well of his task. We wish there had been more information on some points. The microscopical examination of a water is often of such paramount importance that a column in every analysis may be justly devoted to it, and the physical characteristics alone are sometimes enough to condemn a water; but in this book the information on both is deficient. With these exceptions the book merits full circulation, and better still, full consideration by those who are proposing fresh expenditure.

Omega's pamphlet is of a different style, although written ostensibly for the purpose of giving information in reference to the same question. Some three-fourths of it consists of reprints and abstracts of Dr. Frankland's "figures and statements," in reference to the London Water Supply. Naturally the author starts by referring to the sensational paragraphs, which describe the London Supply as "diluted sewage," &c., &c. He then goes on to enquire how it was, that if, as Dr. Frankland states, the Thames was in December, 1876, and January, 1877, "laden with organic matters of the most objectionable origin, which carried down to the intakes of the Metropolitan Water Companies, passed through the filters and were distributed to the consumers," the worst water distributed by any of the Thames Companies during the last two years, contained only one part of organic impurity in 175,000 parts of water.

Further pungent criticisims of the same kind follow. The pamphlet is carefully and cleverly written.

Mr. R. Edge, Manchester, writes us a long letter (for which we regret that we have not space) pointing out the extent to which milkmen are in the hands of farmers, and suggesting that additional power should be given to inspectors to take samples from the farmers' churns, without the intervention of the milkmen in the matter. Why do not the Manchester milkmen form an association for looking after the farmers, as their London *confrères* have done?

Mr. W. G. Crook has been appointed public analyst for Norwich.

Mr. James Napier has been appointed public analyst for West Suffolk.

Dr. T. S. Robson han been appointed public analyst for Hartlepool.

Mr. M. O. Hehner, has been appointed public analyst for Ryde.

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* Churchill. † Simpkin.

COMPOSITION OF THE ASH OF CANE SUGAR.

An analysis, by Dr. Wallace, of the ash of sugar obtained from canes grown near the sea-coast in Demerara, has recently been published. The following were the results obtained:—

		Per cent.
Potash	=	29.10
Soda	=	1.94
Lime	=	15.10
Magnesia	=	3.76
Sulphuric anhydride	=	23.75
Phosphoric acid	=	5.59
Chlorine	=	4.15
Carbonic acid	=	4.06
Peroxide of iron	=	0.55
Alumina	=	0.65
Silica	=	12.38
		101.03
Deduct oxygen = chlorine		0.93
		100.10

ANALYSTS' REPORTS.

Mr. Wigner reports to the Plumpstead Board as follows:

"The adulterated samples this (March) quarter are of an unusually serious character. The statement in the newspapers that the recent outbreak of scarlet fever was suspected to be due to the milk supply led me to take samples from every milkman in the district, and the result is that among 16 samples of milk I found 5 samples were genuine, 1 sample was of very poor quality and in all probability slightly watered, 1 sample was skimmed, 5 samples had respectively 6 per cent., 10 per cent., 20 per cent., 25 per cent. and 45 per cent. of added water; 2 samples were obtained from cows which had calved so recently that the milk was unfit for food, and 2 samples were obtained from a diseased cow or cows. I obtained also 7 samples of butter and no less than four of these were adulterated with 25 per cent., 70 per cent., 75 per cent., and 80 per cent. respectively of foreign fats.

Therefore as regards milk and butter my present report is the most unsatisfactory I have made for some time. It is right that I should point out that the watering of milk is very likely to cause it to become injurious to health, because the contaminated water so often used for this fraud frequently contains the germs of disease, being itself little better than diluted sewage. As to milk from diseased cows I need not say more than that I consider it far more likely to produce illness than diseased meat, because while meat is consumed mainly by adults, milk is the food of invalids and children."

Glasgow Town Council and the Sale of Food and Drugs Act.—The Clerk and Sanitary Inspector reported to the Health Committee on the 11th inst., that, in respect of the decision of the Court of Justiciary in the Appeal, Davidson *v.* Macleod, and the opinions expressed by the Judges therein, Section 6 of the Sale of Foods and of Drugs Act, 1875, which prohibits the sale, to the prejudice of the purchaser, of articles of food and of drugs which are not of the nature, substance, and quality demanded, is practically inoperative. The committee agreed to recommend that in the circumstances it be remitted to the Parliamentary Bills Committee to take such steps as may be deemed expedient, with a view to such an alteration and amendment on the law being made as will enable the authorities to take action for the suppression of adulteration of articles of food and drink. Bailie Ure, in moving the adoption of the minute, asked that the matter of the Sale of Food and Drugs Act be remitted to the Parliamentary Bills Committee with a view to their taking some action, as in the meantime their officers could do nothing. Some suggestion, he thought, should be made to Government to do something in regard to the question.—*Glasgow Herald.*

LAW REPORTS.

At the Borough Police-court, Salford, before Sir John Iles Mantell, Mary Moss, grocer and provision dealer, carrying on business at 75, Ordsall-lane, Salford, was summoned for selling adulterated butter. The Town Clerk (Mr. C. Moorhouse) appeared for the prosecution, and Mr. J. B. Edge, barrister, for the defence. The Town Clerk said that the inspector went to the defendant's shop on February 18, and asked Mrs. Moss for a pound and a half of butter. He asked for that which was in the shop and marked 10d. per lb. The inspector was supplied, and paid 1s. 3d. He told the defendant that he had purchased the butter for the purpose of being analysed, and divided the sample in the usual way. On the butter being analysed, it was found to be mixed with common fat, and was, in fact, what was commonly called 'butterine." There was no ticket or mark upon the butter, except the ticket, "10d. per lb." Mr. J. Carter Bell, public analyst for Salford, said he received from the inspector the sample of butter he

purchased, and on analysing it found it contained 90 per cent. of foreign fat. It was, in fact, butterine of the ordinary class. Butterine is made from animal fat—such as beef fat and mutton fat. Sir John: Then adulterated butter is not butterine? Witness: They mix a little butter with it. Sir John: Is there any prescribed limit when it is called butter and when it is called "butterine"? Witness: Not that I know of. I should not look upon, say 30 per cent. of foreign fat as butterine. Sir John: To say that the article sold was "to the prejudice of the buyer," it must be proved that he was supplied with a worse class of butter than he asked for, and that it was deleterious. Witness: Butterine is not deleterious. Mr. Edge: Have you read the opinion of Mr. Estcourt, the public analyst for the city of Manchester, on butter and butterine? Witness: No. Mr. Edge: Then I will read it to you. In a lecture delivered at the Broughton College on December 14 last, Mr. Estcourt said:—"He regarded the introduction of butterine as a great boon to the working classes, it having to some extent prevented an increase in the price of butter; and he was of opinion that if the prejudice against imitation could be removed it would be largely used, as it was preferable to two-thirds of the salt butter sold." Witness had not heard of that before. He had heard that animal fat is used by the working-classes in lieu of butter, and he thought there was nothing prejudical to health in butterine. Sir John Mantell asked the Town Clerk if he thought it necessary to put in evidence as to the price of butter. They all knew that pure butter could not be bought at 10d. per lb. The Town Clerk: I think not. Sir John: Then I think the case cannot go further. I am convinced that the article was not adulterated. It was sold as butterine, not as butter. It is quite true that it was not sold as pure butter, and the price of pure butter was not paid for it.

Heavy Penalty for Adulterating Gin.—William Clement, of the Saracen's Head, Broad-street, Bath, was summoned for selling, on the 27th Feb., to Inspector Montague, three quarterns of gin, not of the nature, substance, and quality demanded. Mr. H. R. Hodson, barrister, instructed by Mr. F. H. Moger, clerk to the Urban Sanitary Authority, appeared to prosecute, and Mr. J. K. Bartrum was for the defendant. Mr. Hodson having opened the case, called Inspector Montague, who deposed to purchasing the gin. He asked the barmaid if it was the best gin, and she replied "Yes." He paid 5d. a quartern for the gin, being 1s. 3d. for the whole. This was the usual price. He offered to divide the gin but it was refused, and he then took it to Mr. Gatehouse, subsequently receiving a certificate of analysis from him. The certificate of the analyst stated the gin to be 46 per cent. under proof, and that it contained 29 per cent. of added water. The percentage of alcohol was by weight 24, water 76. Solids per cent., 0.062. Witness heard that 17 per cent. under proof was the standard for best gin, and 22 under proof for second quality. It was served from a quart bottle. Had paid the same price for gin at Mr. Carter's bar, which was only 22 per cent. under proof. Had also bought gin at the same price of Mr. Worthy Baker, of Walcott-street, which was 23 under proof. In addressing the Bench, Mr. Bartrum said he should show that the cost price of the gin was 12s. per gallon, and it was retailed at nearly the same price. It was therefore absurd to suppose it was precisely the same. He was told there was one instance in which it was retailed at 22 per cent. under proof, viz., by Mr. Cater. They knew that Mr. Cater conducted his business in a very handsome manner, and this was one of the instances in which the public were well served by him. But because Mr. Cater made so small a profit upon gin they must not place his gigantic business on a par with Mr. Clements. Gin never was sent out by the merchants of greater strength than 17 under proof. He ventured to say that no publican in Bath—excepting Mr. Cater, who was a glorious exception—retailed gin of a greater strength than 38 per cent. under proof. That was the strength Mr. Clement sold his at, but unknown to him this had been made 8 per cent. more than that under proof. The defendant was then sworn, and said he gave 12s. per gallon for gin (Burnett's), and after blending it sold it at 4s. per gallon profit. He added a quart of water to a gallon of gin. After consulting together in private the chairman said the Bench had considered the circumstances, and in the interest of the public, felt it their duty to impose a severe sentence. They ordered defendant to pay a fine of £10 and the costs, including counsel's fee, which was fixed at two guineas.

Sunday Milk.—John W. Hunt, of 46, King Street, Woolwich, was summoned by order of the Local Board of Health for selling adulterated milk. Mr. Farnfield appeared to prosecute. Mr. Carty, inspector, said that on Sunday morning, [illegible] of March, he sent a lad, to buy milk. The analyst certified it to contain 14 per cent. of [illegible] ght the milk from Mr. Sanders, who *purchased it from* London on accoun[illegible] Sunday before Shrove Tuesday.

Mrs. Sanders said it was bought in London on Saturday night. Fined 20s. John Fisher, of 2, Upper Woodland Terrace, Charlton, was similarly charged. Mr. Whale defended. Mr. J. Carty, inspector, said defendant was a cowkeeper. On Sunday morning, the 3rd. inst., he requested a lad to purchase milk from defendant in Prospect Row. The lad asked for a pint and a half, and paid 3d. The analyst's certificate showed the milk to contain not less than 18 per cent. of added water. On a previous occasion defendant's milk had been found genuine, but that milk was not bought on Sunday. The Board had ordered witness to purchase samples on Sunday in consequence of complaints. Mr Whale raised a technical objection, that the person who bought the milk did not inform the vendor that it was for analysis. Mr. Slade over-ruled the objection. Mr. Whale urged in mitigation that defendant bought the milk at East Greenwich. Defendant swore to this, and said the Charlton inspector had frequently before taken samples of his milk. Mr. Slade fined the defendant 20s. George Piper, of 21, Prospect Place, was summoned for a similar offence. Mr. Carty said defendant was a milk-seller. On the 3rd. inst. he sent a lad in for milk, which was reported by the analyst to contain 25 per cent. of water. Defendant said he sold the milk as he bought it. Mr. Carty said the defendant had an inscription on his house "Pure milk sold here, 4d. a quart." Mrs. Saunders said she got the milk from London. Defendant said it would have taken him a week to ascertain if the milk were pure. Mrs. Sanders said this milk was bought from a different person to that supplied to Hunt. This being a first offence, the penalty of 20s. was imposed in this case also, Mr. Slade remarking that as dealers could protect themselves by taking a written guarantee from the persons who supplied them, they would be more seriously dealt with in future.—*Kentish Independent.*

NOTES OF THE MONTH.

The better the day the better the deed is evidently what the Woolwich milkmen act even if they do not think it. For some time past the Inspector has been pretty vigilant, but the milkmen have been more so. A recent Sunday morning, however, found the official at his work, and the unfortunate purveyors of Simpson and Milk not being forewarned were not forearmed. Summary convictions, with a promise of heavier penalties in future, will perhaps sharpen the edges of their conscience a little.

It is said that when a parish beadle is to be appointed canvassing is permitted, but we have heard lately of some cases of canvassing for public analysts' appointments even before they were vacant. This, mind, is not merely the case of a private letter to a friend, or a quiet word in the ear, but house to house canvassing. We can hardly help doubting the fitness of a man for the position if he has to resort to such expedients.

Another idea, or rather a modification of an old idea is brought forward to try and settle the milk question. Milk is to be sold at so much per cent. of solids not fat, or in other words every 1 per cent. of solids not fat is to represent a money value of say ½d. per quart. This would introduce a nice little novelty into analytical work.

We publish the first part of our annual table of Analysts' Returns. We expect to have a few more to publish next month to complete it. We shall be greatly obliged if any analysts who have hitherto overloooked the matter will forward us their returns before the 20th inst.

We are almost tempted to immortalize the name of a public analyst, who h already rendered himself pretty prominent, by pointing out that he is the o analyst in the kingdom who has refused—*distinctly refused*—aye, and even discourteo refused to send us the copies of his returns. But we will have pity. Probably if th were worth printing he would have sent them.

What can the Salford Magistrate be thinking of? A dealer was summoned f selling butterine as butter, and he dismissed the case. So far, perhaps, the proceedi was not very peculiar, but the reason he gave is. He appears to think that because n man could expect to buy genuine butter at 10d. per lb., therefore, if a grocer sells a inspector so-called butter at that price, no fraud is committed. This is another decisi to be kept on record against the day when the Sale of Food and Drugs Act will b amended.

RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can b obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1877. No.	Name of Patentee.	Title of Patent.	Pric
2768	E. C. Prentice	Treatment of Gun Cotton	2d
2801	P. P. E. M. Koch	Preservation of Food, &c.	6d
2842	R. W. Wallace and C. F. Claus ...	Utilizing Gas Liquor in Manufacture of Carbonate of Potash	4d
2882	W. J. Bonser	Preserving Meat, &c.	4d
2922	G. Underwood	Treatment of Iron Ores	2d
2924	H. W. Walker and T. L. Patterson	Apparatus for Refining Sugar	6d
2992	J. Mason	Production of Sulphuric Acid	2d
2993	Ditto	Treatment of Residues from Production of Sulphuric Acid	2d
2999	J. H. Johnson	Treatment of Amylaceous Substances	6d
3082	W. R. Lake	Manufacture of Caustic Alkalies and their Carbonates and Chlorine, &c.	4d
3096	G. Fournier	Manufacture of Agents for Purification of Sewage ...	4d
3115	F. Wirth	Manufacture of Tartaric Acid from Wine Residues ...	4d
3151	J. Frost	Treating the Residuum in Sewage Purification... ...	8d
3174	J. Riley	Manufacture of Salt Cake Alkalkine Carbonates, &c. ...	2d
3203	J. Mason	Treating Residues from Production of Sulphuric Acid ...	4d
3289	J. Stenhouse	Manufacture of Explosive Compounds	4d
3311	W. Marriott	Purifying Gas	4d

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BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medic Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record The Medical Record; The Miller; The Anti-Adulteration Review; Journal of Applied Science The Country Brewers' Gazette.

THE ANALYST.

WATER ANALYSIS.

We have before drawn attention to the question of the analysis of water by public analysts. There is no doubt that water ought in the ordinary course to form a fairly remunerative part of an analyst's practice, and that the office of public analyst should secure for a competent man an increase in the number of samples of water submitted to him. But we regret to have to point out once more that a number of Public Analysts appear to be analysing waters as if they were included under the Sale of Food and Drugs Act. We thought some time ago it was enough merely to draw attention to the second section of that Act; that section enacts that the term "food shall include every article used for food or drink by man OTHER THAN DRUGS OR WATER." There are no other words in the Act which in any way qualify or limit the definition here given, and it is perfectly clear that all public analysts are entitled to charge for samples of water as if they were independent or private samples instead of analysing them as part of their official duties as public analysts. Some few may consider that this is a matter which concerns themselves only, but it does not appear so to us. On the contrary it is tolerably notorious that because in some districts samples of water are taken as if they were samples of food, analysts in other districts are expected to do work which the Act never intended to be given to them at unremunerative rates. We do trust that in future we shall not hear of any samples of water being analysed except for separate fees on a fair scale.

SOCIETY OF PUBLIC ANALYSTS.

As the Meeting of this Society is held on the day we go to press we are compelled to hold over our Report of the Meeting until our next number, but we publish one or two papers which are to be read before the Society on that occasion.

THE AMENDMENT OF THE SALE OF FOOD AND DRUGS ACT.

By A. Wynter Blyth.

Read before the Society of Public Analysts, on the 20th March, 1878.

In this short paper I am going to strictly confine my remarks to a proposition or suggestion substituting a peculiar system of reference from one analyst to another, instead of the present Court of Appeal in Somerset House. That the present system is in the highest degree unsatisfactory, not alone food analysts but the general public are quite united in agreeing, and without attempting to prove what requires no proof, I may shortly state that in nine cases out of ten it is, as has been frequently pointed out, a reference from a higher to a lower authority. If, for example, Dr. Dupré, whose experience in the analysis of wine must be very great, should certify to the sophistication of a given sample, his decision is liable to be reversed by chemists, who have never by publication, or in any other manner, proved that they possess any special practice in, or knowledge of, that particular subject. Such a case would be somewhat analagous to the

decision of a judge, versed in criminal law, being referred to a solicitor in Government pay. If, however, experience had in any way justified the objectionable clause in the Sale of Food and Drugs Act, the anomaly, though still existing, would not have been worth notice; but experience more and more serves to strengthen the suspicions that secret methods infallibly excite, and the vague reticence and inconsistency of the Government certificates confuse the magistracy, perplex the analyst, and provoke at once the gratitude and contempt of the guilty tradesman. Opinions may differ as to the necessity of appeal at all, although there can be no difference as to the undesirability of continuing the present system.

Allowing, however, that in the nearly 16,000 analyses of food which appear to be made yearly a few mistakes are possible, it may be freely conceded that any suggestion which would protect a really honest trader from the accident of a false accusation on the one hand, and on the other support the food analyst in the conscientious discharge of what is often an unpleasant duty, should be considered.

The aim of appeal is the protection of the innocent, not the double conviction of the fraudulent; and it is self-evident that the best protection of the former is to take every precaution that the accusation is well founded, and to render it almost impossible for any analyst, even should it happen that he is hopelessly unfit for his post, to give an untrue certificate, for it must be remembered that in the case of an accusation, subsequently shown to be unfounded, the injury lies in the accusation itself, and cannot be wiped away from record or memory; nor can you ensure that each living soul, who has heard or read the original charge, shall also hear or read the subsequent justification, and even if that could be done, how often it happens that the former is spirited and sharp, the latter dull.

My proposal is this:—

The analysis of all adulterated samples, by two independent analysts, the local analyst and a referee.

No charge heard, or summons granted unless supported by a joint certificate.

This scheme is neither wild nor visionary. It would require a system of referees, which might follow the registration divisions, viz., one or more for the Midland Counties, one or more for the Northern, for the South Western, &c., &c., the Metropolis and certain large towns being, of course, treated separately. The referees would naturally be appointed from the Society of Food Analysts, or at all events no referee who had not paid attention to the subject could be considered a desirable appointment.

The details of the system would be something like the following:—There would be, say referees, A, B, C, D, for the Northern, Midland, South Western, and Eastern Counties, and taking the district A there would be analysts d, e, f. Either of the latter receives from their inspectors a certain number of samples; a few of these are found adulterated. The local analyst immediately forwards to A his sample, stating, if necessary, the processes he has employed and his conclusions. He also sends notice to the person who submitted to him the sample requesting him to forward his sample to the referee. If the conclusions of the latter are pretty well identical with the former, the referee merely countersigns the certificate; if he differs entirely, a certificate would be merely given that there is a difference of opinion with regard to the sample in question, and then, of course, no action could be taken.

If the referees A, B, C, D, are themselves in practice as food analysts, A's samples

would go to B, B's to C, and C's to D, or otherwise as the Local Government Board might direct.

The expense of the double analysis should, in every instance, where a conviction is obtained, be deemed part of the costs—the few cases in which a difference of opinion would exist, would have to be paid by Government.

There should be no jealousy with regard to the appointment of the referees; they would probably be selected by the Local Government Board; and there should, on the part of the referees, be no assumption of superiority or precedence over their brother analysts.

The only real objection to the scheme that I see is the possible protection and perpetuation of incompetence, as we all know several so-called analysts have disappeared, having been compelled to resign their posts, and one can readily see that a competent referee would protect a very ignorant man from the ordeal of cross-examination in a public court.

This is not, however, an insuperable difficulty, for I apprehend that all the certificates, both of conviction and of difference, could be transmitted to the Local Government Board, and that thus an analyst, unfit for his post, would be quickly discovered and dismissed.

We can, on very few questions, hold the same opinions, but should a majority of the food analysts agree with me as to the desirability and expediency of this scheme, I trust they will lose no time in trying to get it embodied in any amended act.

ON DISEASED MILK.

By C. Heisch, F.C.S.

Read before the Society of Public Analysts, on 1st May, 1878.

The question of milk from diseased cows having been recently, for the second time, brought under my notice, both by the cases of Mr. Wigner, at Plumstead, and one sample received by myself from Hampstead, I am induced to lay before the society the details, not so much of the recent case (of which, beyond the microscopical appearances, I know nothing), as of two which came to me some time since, of which, through the courtesy of the owner of the cows, I got a more than usually complete history, though some points were not as clear as could have been wished; nevertheless, some features of the case were so peculiar and of such interest as to be worthy of note. First, with respect to the recent case. The milk presented no peculiar appearance; the cream rose in the ordinary way, and had the ordinary colour. On examining a drop under the microscope I found numerous bodies similar to those described by Mr. Wynter Blyth, in his paper read before the Society and published in its *Proceedings** (which, for convenience, I shall speak of as Blyth's bodies), pus corpuscles, blood corpuscles, and pieces of skin strongly tinged with blood. Chemical analysis showed little peculiarity.

Total Solids ...	11·32
Solids not Fat ...	8·65
Fat ...	2·67
Ash ...	·65

Cream 10 per cent. by volume.

Of this case I have no further history, the Vestry not yet having made up its mind about prosecuting

* See vol. 1, p. 239.

On January 17th, 1876, I received from a private client two samples of milk and one of cream, with the intimation that all the members of the family who used the milk had been ill, and it was believed the illness was caused by the milk. The cream was from a mixture of the milk of both the cows, which had yielded the samples of milk.

No 1 gave the following results :—

Total Solids	13·97
Solids not Fat	9·61
Fat	4·35
Ash	·71

Cream 12 per cent. by volume.

Examined under the microscope, showed many Blyth's bodies larger than those mentioned in his paper; blood corpuscles and unmistakable blood bands in the green, when viewed in the spectroscope. All the foreign bodies rose to the surface with the cream, leaving the milk free.

No. 2 gave :—

Total solids	10·54
Solids not fat	9·64
Fat	·90
Ash	·60

Microscope showed colostrum, or a body closely resembling it; blood corpuscles and blood bands in spectroscope.

No. 3. The cream had a peculiar reddish colour, and showed all the above appearances in a marked degree. I subsequently received the following particulars from the gentleman who owned the cows :—

Both cows had foot and mouth disease, not severely, in July, and to all appearance quite recovered; both were in calf. No. 2, a young cow, calved in August; the family being from home, all her cream was made into butter, and sent to them; the skim milk being used by the servants. No ill-effects were produced. The butter milk was given to the pigs; as they had been suffering from foot and mouth disease, no particular notice was taken of its effect. Cow No. 1, an old one, calved on December 24th ; her milk was not used till January 11th. Two days after, the children and nurses using the new milk, and those members of the family who used cream, were attacked with symptoms strongly resembling severe influenza, were very feverish and suffered from great soreness of the inside of the mouth, throat, and tongue, which were covered with small pustules. The servants, who took only the skim milk, were unaffected. One child, who for two days refused everything but water, got pretty well rid of her symptoms, but they returned as soon as she began to use the milk. The use of the milk was then given up, and all bad symptoms disappeared. The samples of milk were then sent to me, and the results of the examination were as above given. The reason both milks were sent, though no mischief had been traced to No. 2, was that the milk of the two cows had been mixed before using.

On 24th January I received two more samples of milk from the same cows, which gave the following results :—

No. 1.—

Total solids	17·77
Solids not fat	9·60
Fat	8·17
Ash	·68

The cream was very thick, of a slightly reddish colour. The microscope showed a

few of Blyth's bodies, not so many as on the 17th, and the bl bands were scarcely visible. The skim milk as before was quite free from abnormal substances.

No. 2.—

Total solids	12·86
Solids not fat	7·82
Fat...	5·04
Ash...	·82

Microscope showed colostrum-like bodies and casts of the mammary glands, and blood bands were visible in spectroscope.

The remarkable change in the character of this milk leads to the idea that first runnings had been sent in one case and last in the other, but the appearance of colostrum, or a body so like it as to be undistinguishable from it, so long after calving is very remarkable. On February 1st I heard from the owner that they were again using the milk with no bad results. The case of cow No. 1, to which alone mischief was traced with anything like clearness, seems to be one of those in which disease after it has disappeared in a pregnant animal re-appears in some form after confinement, sometimes the young animal being affected, and sometimes, as in this case, the milk; but such a case raises the somewhat difficult question how far a milkman can be held reponsible for selling milk containing all these abnormal constituents, and capable of creating so much mischief, if the cow from which it is obtained is apparently in perfect health? It would seem as if no milk from a cow which has been ill during pregnancy ought to be sold till it has been examined and found free from abnormal consituents. In both these cases *all* the abnormal constituents rose with the cream, which was not the case either with the sample recently sent from Hampstead or with Mr. Wigner's samples.

ON SOME RECENT CASES OF DISEASED MILK.

By G. W. Wigner, F.C.S.

Read before the Society of Public Analysts, on the 1st May, 1878.

I have recently had some samples of diseased milk brought to me officially by the inspectors of one of my districts, and they present such features of interest, not only chemically and microscopically, but in view of the fact that for the third time the magistrate has convicted where diseased milk has been sold, that for the general information of others I give the characteristics of the milk in question.

The immediate cause which led to their being brought to me was that an outbreak of fever had occurred almost simultaneously through a considerable portion of Lee, Kidbrook, and Blackheath, and consequently, as the outbreak was supposed to be due to the milk, I directed the inspectors to bring me samples from every milkman supplying those districts. The first of the diseased samples was received by me on the 19th March; its colour had a decided tinge of blood, which was visible even through the tinted glass of the common medicine bottle in which it was contained. The portion I poured into the cream tube had a blood or orange wine tint, and the cream which rose in the tube showed this peculiar colour still more markedly. As soon as the inspector brought the sample I called his attention to its peculiar tint, but he had received no information from the vendor which threw any light on the matter.

I commenced the microscopical examination almost immediately, and found that the

sample showed a very large number of pus corpuscles very different in their appearance from the true fat corpuscles of milk, and the addition of a minute drop of ether to the milk on the slide brought up the tristellate nucleus very distinctly in many of them. In some parts of the slide there was a distinct reddish colouration, which, however, was not uniformly spread over the whole field. Nearly every field contained a considerable number of pieces of epithelial matter and other animal debris, mostly tinged at the edges with a blood colour. The micro-spectroscope showed blood bands plainly when any of these blood tinged pieces of epithelial matter were in focus, but when the field was shut down by a diaphragm so as not to include any of the streaked pieces it was not possible to detect the blood bands. Blood discs could be seen in some few places, sometimes singly but mostly arranged in groups like clotted blood. In other parts of the slides, but irregularly distributed, were a considerable number of the peculiar bodies described by Mr. Wynter Blyth, in *The proceedings of the Society of Public Analysts*,* as being found in milk yielded by cows suffering from foot and mouth disease; some of these bodies were scimitar shaped, and others more closely resembled the appearance which would be produced by the coalescence of five or six fat globules in an almost straight line, the division between the globules being almost entirely obliterated.

On the second day the physical characteristics of the milk as distinguished from the microscopical were still more indicative of peculiarity. The residue of the sample remaining in the bottle had not curdled in the ordinary way in which milk curdles when it turns sour, but had partially solidified much in the same way as ordinary colostrum milk solidifies when it is boiled—viz., to a consistency closely resembling that of ordinary blancmange in hot weather. This blancmange adhered with some little force to the sides of the bottle, and when the latter was shaken so as to detach the blancmange the glass was left quite clean, while the milk itself moved about in the bottle, still retaining its semi-fluid condition. The cream had, of course, to some extent risen to the top of the bottle, and was of an orange colour, while the colour of the lower part of the milk was very little changed. In the cream tube the top surface of the cream had by this time (*i.e.*, after 24 hours) assumed an unusual appearance, being mottled in colour and corrugated, resembling more closely the crust of a Stilton cheese than any other common object with which I can compare it. The microscope still showed many of Blyth's bodies although not so many as on the previous day; many colourless blood corpuscles were visible, and by using a ¼-inch objective and B eyepiece it was easy to count a considerable number of coloured ones. The pieces of skin, which were stained with blood, were as visible as before, and the colour did not appear to have altered in intensity. When a small portion of the cream alone was taken out on the point of a stirring rod it was found that the abnormal characteristics of the milk were exaggerated in the cream—*i.e.*, there was a larger proportion of the foreign bodies than was present in the whole milk sample, evidently showing that there was a tendency in the cream on rising to entangle with it the pus and blood corpuscles.

On the third day there was a still further change in the appearance of the cream tube, for the top of the cream was covered with a peculiar and (to me) unknown fungus, although the tube had been standing side by side with seven other samples of the same date, none of which presented that appearance. The lower part of the milk in the tube was breaking up in a manner which as far as I can judge at present is perfectly characteristic

* See Vol. 1, page 239.

of diseased milk. Instead of curdling to an irregular mass, or instead of the separation of the whey taking place up to a certain level in the tube, the whey had separated in peculiar streaks, running in a vertical or almost vertical direction up and down the tube, these streaks being from $\frac{1}{8}$ to $\frac{1}{4}$ inch wide, and in some cases as much as 3 inches long. The whey viewed in these streaks against the background of curd in the tube had a tint resembling Irish whisky. On this day I examined 10 or 12 slides but I could not succeed in detecting more than 3 or 4 of Blyth's bodies. Here then we have a tolerably convincing proof that whatever these bodies may be they disappear either by becoming transparent or by breaking up as the milk decomposes. Some of the pus and blood corpuscles were still visible, but the number of the former was decidedly less, and some of them seemed to be bursting or else gradually becoming so transparent as to be invisible.

On the sixth day the sample was so much decomposed that if I had then examined it for the first time, although I should certainly have said that it presented some abnormal characteristics, I should have been unable to identify them in the way I have already described. In other words, for practical work the examination on this day would have been useless.

Having obtained such results as these I had no hesitation, notwithstanding that the chemical results were perfectly consistent with genuine milk, in certifying that the sample came wholly or in part from a diseased cow, and was therefore unfit for human food. I did not state that it was much more likely to be an admixture of the milk of a diseased cow with the milk of healthy cows, but still from the streaky condition of the milk and by the slides which I examined, I am inclined to that opinion.

The above results being so unsatisfactory I directed the Inspector on the 20th March —*i.e.*, one day after receiving the first sample—to procure another sample from the same vendor. I examined this sample in precisely the same way and with the same precautions, but the difference between the microscopical appearance of the two samples was very slight, the second one contained rather fewer pus and blood corpuscles, and I think there were also fewer of Blyth's bodies present, but in other respects the general characteristics of the samples were as nearly as possible the same. The milk in the cream tube had a little higher colour, perhaps more correctly described as a brighter colour. The chemical results of the second sample were slightly better, showing solids not fat 9·7 instead of 9·3.

Mr. Heisch examined both samples at my request within a very short time of their reception by me, in fact the second sample he examined as soon as I did, and his results fully confirmed my own.

Here, therefore, we have a clear case of diseased milk sold for ordinary consumption. The question now comes what was the character of the disease, and the evidence which was given on the hearing of the case threw some light on this, although unfortunately it did not fully identify the source from which the milk came; that is, although it was proved that it came from a dairy one cow in which was diseased, it was not proved whether the actual churn from which the sample was taken contained any of this diseased cow's milk. I, however, think the inference is clear that it did, and for these reasons—My first sample was purchased by the inspector on the morning of the 19th March ; on the evening of the 20th, finding that the milk was abnormal, I wrote to the inspector for a second sample. On the same day—the 20th—one of the defendant's cows

presented signs of illness, and his attention was drawn to it. On the 21st the Inspector received my letter requesting a second sample, but he had not time to procure it that day. On that day (the 21st) the defendant came to the conclusion that the cow was suffering from lung disease, and sent for a veterinary surgeon. On the morning of the 22nd, according to the evidence, the cow had very nearly "gone off" milk. The Inspector bought another sample that day which was characterised by the defendant's wife as being streaky, and after the bottle was filled the defendant's wife said it "must have had blood in it"; consequently the Inspector emptied the bottle and took another sample from the same churn. Later on the same day (the 22nd) the veterinary surgeon came and saw the cow, which he said was suffering from pleuro-pneumonia, and it was consequently killed.

The evidence, therefore, that the milk which I pronounced diseased came from this cow is purely circumstantial, but the chain of circumstances is so complete that I think there is no fair reason to doubt that it was so.

In considering, however, the results I obtained, and my reasons for saying that I thought the sample injurious to health, two or three other points must be borne in mind. My reason for classing it as an injurious sample was that I believe the presence of pus or blood corpuscles, or of any abnormal ingredients of this kind in milk must, to some extent, be liable to produce gastric irritation, and therefore to prove injurious to health; but, on the other hand, it must be pointed out that the outbreak of fever which led to the examinations of these milks was not due to the milk from this particular diseased cow, as the fever had occurred some two or three weeks before the sale of this diseased milk, and I cannot find any evidence to prove, or to lead me to think, that the cow had been ill more than a few days. There were, however, clear proofs that there had been other cases of pleuro-pneumonia in cows in the same district, just about the time when the fever broke out. As there was no *post mortem* examination of the cow, it is not possible to say whether the pleuro-pneumonia was complicated by any disease of the udder or not, but the defendant did not produce any evidence of disease or injury to any other cow, or of injury to the diseased cow.

One of the most important lessons to be derived from this case is the absolute necessity of making a microscopical examination of every sample of milk, and of doing so immediately the sample is received. The case should also serve as a hint to those who still believe that the determinations of the solids not fat and fat are all that is requisite, and that the use of the microscope is unnecessary. In this case, although fever had been spreading through the district in which this milk was being distributed, and although the milk was conclusively proved to have been diseased, yet the samples were of such a character as to satisfactorily pass an ordinary chemical analysis.

THE BROMSGROVE MILK CASE.

WITH reference to this case, a report of which appeared in our March number, page 227, we reprint from the *Worcestershire Chronicle* the following report of Dr. Swete, presented to the Worcestershire Quarter Sessions:—

I have the honour to report to you that, during the last quarter, I have received for analysis 27 samples of food. Ten of these were milk, of which 2 were adulterated with water seriously, 1 to a very slight degree, and 7 were genuine; 4 of butter, which were genuine—1 sample had the low melting point and general appearance of butterine, but a complete analysis proved it to be genuine, 12 of bread, 9 genuine and 3 contained alum in small quantities, but insufficient to suppose a wilful adulteration. I have also received 5 samples of water, 4 were polluted and 1 wholesome. Some seeds and the body of a pigeon and

the crop of a bird were brought to me by the police for analysis, from Upton-on-Severn. I found that the birds had been poisoned by strychnine, and that the seeds were wheat, boiled with the seeds of strychnos nux vomica, containing thr deadly poison of strychnine and mucine in large quantity. The person who exposed these seeds was fined for the offence. I append to my report the tabulated statement required by the Local Government Board.

In my last report I stated that I had received 6 samples of milk from Bromsgrove, of which 5 were adulterated and 1 (marked W) of excellent quality. I regret to state that in the case of Y. B. (Thomas Fisher) I was in error, and in justice to him and to myself think it right to lay before you the details of the case, and the way in which so lamentable an error occurred. The samples were sent to me by letter, and I need not say that it could make no difference to me whether the analysis showed them to be good or bad. If there was any difference it would be in favour of my reporting them as good, as I was informed in that case one vendor wished me to make a second analysis and give him a report for publication; so that I should have received another fee. The milks were all analysed at the same time, with the same care, and using the same ether, which I specially distilled the same day for the purpose. Yet W turned out to be good and the rest more or less bad. The care and the ether were clearly not at fault. That part of the analysis which was conducted in platinum vessels of known weight, and the weight of which hardly alters during a year, agreed with the results of the analyst for the defence and the chemists of Somerset House. The error, therefore, was traced to the porcelain dishes of various weights in which the fat was determined. The old plan used to be to use platinum dishes for this purpose, and to measure, not weigh, the milk. Finding this plan gave a disadvantage to the vendors of milk, I adopted that of weighing the milk and using porcelain dishes, and on tracing out the mistake, I found that it clearly arose from my assistant, when weighing the empty dishes, making an error in noting the weights, which of course invalidated all the results. I do not for a moment wish to shelter myself by an error of an assistant, but I can confidently state that the chemical part of the analysis, which I personally performed, was conducted with extreme care, and with the purest chemicals. I was myself anxious that the sample should be sent to Somerset House, as I was fully convinced of the honesty of my analysis. Afterwards, on re-analysing the milk, I found it to be pure, and that the analysis of the defence was correct. A sample of milk was also sent me, labelled "Bromsgrove," just before these cases were heard at Petty Sessions. This I certified as pure, and I found afterwards it had been taken from the dairy of one of the magistrates, and was notably sent to me as a test of my process of analysis of milk. After the decision of Somerset House, I received a request that I would declare the milk of a Mr. Whitehair also pure, and that I had made a similar error in his case. I replied, I could not do this, as I did not know which sample belonged to him, not having before heard his name; that as his sample was not challenged by the defence, the remainder had been destroyed, so that I could not re-analyse it, but I advised my explanation should be shown to the Court. I then received a legal notice that if I did not at once pay the costs and expenses of Mr. Fisher, nearly £20, I should be proceeded against in the County Court. I replied that I would pay no compensation on compulsion, as I was ready to defend any suit, and that as Somerset House had condemned the analyses of many very eminent public analysts, it would not be right of me to create such a precedent. Finding, however, that Mr. Fisher was a poor man, that he was fully satisfied with my explanation, and did not impute any incompetence to me, and that his solicitors expressed their satisfaction at the way in which I met the case, I sent him as compensation five guineas, which, with the guinea allowed him by the Magistrates and the certificate of Somerset House in his favour, will, I trust, prevent him from being injured either in pocket or reputation by so lamentable an error, which I deeply regret. I have since conducted, and shall continue to conduct, food analyses in duplicate, so that any laboratory error may at once be detected.

Sir Richard Harington (deputy chairman) said that notwithstanding the explanation that had been offered by Dr. Swete, this seemed to him to be a matter of very serious importance indeed, because if a mistake of this sort was committed on one occasion, it must necessarily tend to give excuse for controverting the accuracy of the analyst on future occasions. He therefore thought it became the duty of the Court to look with some care into the explanation that had been offered. When the case was before the Magistrates —[Sir Richard was on the Bench]—Dr. Swete's analysis was—solids not fat, 11.22; fat, 1.76; ash, ·7. The defendant in answer to that called Dr. Bostock Hill, the public analyst of a neighbouring county, whose analysis was—solids not fat, 9·22; fat, 3·47; ash, ·69. Upon that the third sample, which was kept under the provisions of the statute for that purpose, was sent to Somerset House, and the result of the analysis there was—solids not fat, 9; fat, 3·35; ash, ·74. This was really more favourable to the vendor than his own witness's analysis was. It was not in his (the speaker's) recollection that anything was mentioned as to any part of this matter having been entrusted to an assistant. Dr. Swete was cross-examined on the various steps which he took in the course of the analysis, and though no question was put to him which required a categorical answer, whether he employed an assistant or not, he did not remember any mention being made that an assistant had anything to do with the matter. Dr. Swete was then confident that his analysis was correct. It would be observed that there were two errors in Dr. Swete's analysis as compared with the other two—the solids not fat were about two per cent. more, as compared

with the other two analyses, and the fat about the same quantity less. How that was explainable by a mistake in weighing the porcelain dishes only he (the speaker) did not understand.

Mr. Curtler said it was extraordinary that the explanation was not forthcoming until after the analysis at Somerset House; this explanation ought to have taken place when the case was before the Magistrates at Bromsgrove. Dr. Swete's certificate was taken to be conclusive evidence in cases like that under discussion, but he (Mr. Curtler) wanted to know whether any Magistrate in the county would now convict on his certificate. If not, the Act of Parliament would be a dead letter. He did not think that the Court, acting as the trustees of the public, had any right to accept Dr. Swete's explanation. He thought there should be an inquiry to ascertain whether Dr. Swete was a skilled man or not.

Dr. Swete, who desired to give an explanation, said, in reference to the Bromsgrove case, that he took every possible precaution, as he thought, but unfortunately did make the error. He did not keep an assistant, but a friend was staying with him just before Christmas, when the sample of milk came in, and his friend, finding he (Dr. Swete) was very busy, offered to weigh the dishes for him and write the weights down. Whether he mistook a 3 for a 5, or how it was, he could not say. Dr. Swete explained how the analysis was conducted, and said he could not declare his error to the Court because he had not then discovered it. When he found out his error he wrote to the analyst engaged by the defendant, and told him how wrong he (Dr. Swete) was, and begged him to show the letter to Sir Richard Harington at the Court.

The Chairman asked why Dr. Swete did not make the explanation which he had made to-day before the magistrates at Bromsgrove when the case was decided.

Dr. Swete replied that he was not cited to attend, and he did not consider he had any right to appear there. In reply to Sir R. Harington, he added that he said nothing, when cross-examined, about employing an assistant, because he then hardly knew it himself. It was only when he came to look through the thing, and his books, that he found how the mistake occurred. Then he remembered that a relative was staying with him and assisted him.

After a consultation with the magistrates,

The Chairman (Earl Dudley) addressing Dr. Swete, said that a more grievous mistake than he had admitted could not have been made. He (the Chairman) thought it quite sufficient for Dr. Swete to have appeared in Court and made the remarks that he had done, and to have been called upon to listen to the observations that had been made. He did not think, at the present moment, that any further action should be taken; what the future might suggest to any magistrate he did not pretend to say—as he was now addressing Dr. Swete he did not think it requisite to do so; but, at the same time, he should not be performing his duty if he did not say that the position in which Dr. Swete had placed himself—inasmuch as the duty was always an invidious one, and one which must always call down upon him a great deal of hostility—was a very awkward one, by the fact that an error had been committed which he himself had been constrained to allow.

Dr. Swete said he would take care that no assistant was employed in future, and as he intended to execute all analyses in duplicate any error would be at once discovered.

The Chairman said that if an error had been committed—and a very grievous one, it might be—he did not think that any other course could be pursued than that it should be fully admitted, with an expression of regret and a promise that, as far as a man could possibly carry out a promise of that sort, it should not be repeated. Any such repetition would be looked upon as a very serious calamity.

REMARKS ON THE WORK DONE BY PUBLIC ANALYSTS DURING 1877 UNDER THE SALE OF FOOD AND DRUGS ACT.

By G. W. Wigner, F.C.S.

Read before the Society of Public Analysts, on the 1st May, 1878.

I am very glad to be able to lay before the Society this evening these returns of the work done officially by our members and a few other gentlemen who are not members, but who have kindly forwarded to me their lists. Part of these returns were published in a tabulated form in the April number of The Analyst, and the remainder will appear in the forthcoming number, together with the remarks I shall make upon them this evening.

The first point, of course, which attracts attention is as to how the general percentage of adulteration stands as compared with previous years. During the time of the

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Lancet commission 65 per cent. of the samples were found to be adulterated, while when the 1872 Act was in force 26 per cent. were adulterated. During the years 1875-76, according to our returns, the adulterated samples had decreased to 18·10 per cent., while the present returns show that the percentage has decreased again to 17·71 per cent., or ·39 per cent. less than previously. This is a change for the better, although a small one, as showing adulteration to be still on the decrease, but this slight decrease may also be taken to indicate that the fines imposed are in most cases insufficient to repress adulteration; while, looking at it from another point of view, it may be considered satisfactory, inasmuch as a gradually-increased amount of work having been done, and a larger number of fresh districts having been brought under the influence of the Act, fresh hotbeds of adulteration, so to speak, have been opened up. The increase in the number of samples analysed is very striking. During the two years ending December, 1876, the total number of articles examined in 103 districts was 15,989 samples, while our returns this year, from 127 districts, show a total of 14,785 samples, or a little more than 1,000 less than in the two previous years. The labour entailed upon individual analysts in preparing these returns is so great that, gladly as I know they are welcomed by others, I can scarcely wonder that in a few cases they are deficient in some of the details it was thought desirable to set out in the table. Owing to this fact the percentages of adulteration of each individual article may differ very slightly from the real fact, but as, out of nearly 15,000 samples, we have full particulars of about 12,000, the error is a trifling one.

Calculating each article or class of article separately, and omitting Dr. Cameron's and Mr. Horsley's figures, because they give no details, I find that the number of samples purchased, and the percentages of them found adulterated, are as follows:—

	Purchased.	Adulterated.
Milk	3,214	26·07 per cent.
Butter	681	12·48 ,,
Groceries	2,993	13·00 ,,
Drugs	403	23·82 ,,
Wines, Spirits, &c.	1,351	47·00 ,,
Bread and Flour	1,067	6·84 ,,
Sundries	818	21·63 ,,

A glance at the above figures will show that milk has lost the worst position which it occupied last year, and that its place has been taken by wines and spirits, in which the amount of adulteration is nearly equal to half the samples purchased. In both these cases the adulterant may, in nearly every instance, be assumed to be the same, namely, added water, but, in one view of the matter, the offence is greater when water is added to a valuable liquid than when it is added to a liquid of comparatively small intrinsic value.

From another point of view, I find that the adulterated samples alone may be divided as follows:—

Milk	36·6 per cent.
Butter	3·7 ,,
Groceries	17·1 ,,
Drugs	4·2 ,,
Wine and Spirits	27·6 ,,
Bread and Flour	3·1 ,,
Sundries	7·7 ,,
	100·0

In this case again the milkman and the grocer show an improvement upon the last returns. The percentage of adulterated milk has decreased from 51·22 to 36·6, and the percentage of groceries and butter from 29·1 to 20·8.

Drugs appear worse than before, as may be expected, when it is seen that out of the 403 purchased 96 were adulterated; and yet, notwithstanding this state of things, I do not at present call to mind a single case in which the Pharmaceutical Society has, during the past year, instituted a prosecution for the sale of adulterated drugs.

Bread and flour have a slightly larger percentage than previously, but the principal increase is in the case of wines, spirits, and beer, where, instead of the 6·04 per cent. which appeared last year, we now have 27·6 per cent. There is, however, in my opinion, no doubt that a great deal of this increase is more apparent than real. Prior to the date of the last returns it is doubtful whether an analyst would have been justified in certifying diluted spirits to be adulterated, but the decisions which, from time to time, have been reported in THE ANALYST have shown, with approximate accuracy, what the standard of spirits was expected by magistrates to be, and therefore many samples, which would previously have been passed as satisfactory, have been condemned.

We may also look at these returns in another light, and notice what the percentage of adulterated samples is on the total number purchased. Omitting Dr. Cameron's and Mr. Horsley's figures as before, I find that 11,430 samples were purchased, and out of these the adulterated samples were as follows :—

Milk ...	7·33	per cent.
Butter...	·73	"
Groceries	3·70	"
Drugs ...	·83	"
Wines and Spirits	5·54	"
Bread and Flour	·64	"
Sundries	1·55	"

So far then for the general features of the returns, and now in a few words I will consider the special ones. The first thing which strikes the eye is the vastly different proportions between the number of samples analysed in different districts. Thus for instance we find Somersetshire with 814 samples, Surrey with 455, Stafford with 667, and Cornwall with 28, while Norfolk figures with a grand total of 7 samples. In this last case it really seems wonderful that notwithstanding Mr. Sutton's well-known standing his inspectors should not have taken more samples to him or that it should have been considered unnecessary to have more than that number examined. In Mile End Old Town, where according to the previous returns 1 in 72 samples was adulterated, the authorities appear to consider that enough has been done, and therefore during the past year no samples at all were purchased. Hampstead previously showed 1 in every 59 to be adulterated, it now shows 7 in 62, which approaches a little more to the average proportion. At Hackney we had before 9 in 214, we now find (omitting 10 waters, all of which were condemned,) 20 in 110—in the latter case it is clear there has been some improvement in the mode of purchasing samples, perhaps instead of inspectors in uniform procuring them unknown persons have been employed.

Scotland, again, appears in a very unfavourable position, the number of samples analysed being only about 350, while Ireland, on the other hand, shows a very large total, mainly as the result of Dr. Cameron's 2748 samples.

Looking at the returns as a whole I think they bear out the statements which have been so often made, that the Act needs to be made compulsory, and that the samples should be purchased by unknown persons, and not by well-known officials. Viewing the matter in a broad light it seems an almost incredible thing that in a country like England one-fifth of the samples purchased by officials are found to be adulterated within the meaning of the Act. Surely if one-fifth are found adulterated when purchased in this way the percentage of adulterated articles obtained by private purchasers must be very much larger.

It seems to me very important that this tabulated statement should be brought under the notice of the Local Government Board as early as possible, as naturally their returns cannot yet be made up so completely.

INSTITUTE OF CHEMISTRY.

Inaugural Dinner.

(*By your own Telephone.*)—From the *Chemist and Druggist.*

Amongst the many varied and highly important capacities in which I have been employed, I can recall no instance where my services have been called into requisition for a more laudable purpose, or with a view to such interesting results, as on the occasion that I had the honour of placing myself at your disposal to report the proceedings of the Institute of Chemistry of Great Britain and Ireland, at its inaugural dinner. This eminent Association, true to its praiseworthy resolve to shroud its proceedings in mystery, and its members in seclusion, had determined, as most of your readers will be aware, to exclude from its festive board, with the utmost rigour and impartiality, every species of representatives of the Press. But, sir, when, in the historic tones of Mr. James G. Bennett, you commanded me to "go and find Franklin," I did not, as most of the members of the "Institute" would probably suppose, immediately dash away to the Admiralty and buy the *Pandora*, nor telegraph to the Montserret Company for six million pipes of lime juice, and then frantically appeal through the second column of the *Times* for information as to the whereabouts of Sir George Nares. No, sir; for as the pensive gloaming gathered round the last hours of that day in the calendar, marked by so many sad experiences and chastened reflections, snugly sheltered beneath the arm of my great protector, Mr. Graham Bell, I was reposing in the bar parlour of the "Burlington Arms," whilst my noble guardian was cajoling a wily waiter into permitting him to view the feast, at which the sons of alchemy were soon to congregate. Once within the banqueting chamber it was but the work of a few moments for my good genius to secure me a safe retreat immediately beneath the president's dinner napkin. From this ambush, unseen and unsuspected by the guests, I was soon busily at work. For once the veil of secresy was rent; a "chiel" had crept in within the mystical doors of the "Institute," diamond had cut diamond, and your readers are enabled to participate in the events of that festive night from the moment when the chairman's first burst of rhetoric sent my diaphragm vibrating away at the rate of six hundred million pulses per second (Benson's time), until the last faint strains of that classic ode, "We won't go home till morning" were being gently wafted down the areas of Piccadilly.

The inaugural dinner of the members of the Institute of Chemistry of Great Britain and Ireland was held on the evening of April 1, at the Burlington Arms, Piccadilly, W., the President, Dr. E. Frankland, occupying the chair.

The band of the Canterbury company was in attendance, and by its high-class and patriotic music, contributed much to the enjoyment of the evening. The cloth having been removed, the Chairman rose and said:—

Gentlemen,—The first duty which I have the honour to perform to-night is to propose the toast of "The Queen." It was my hope that one member, at least, of the Royal Family would have been graciously pleased to join us at our inaugural dinner. Our Council addressed, as you may be aware, a letter to His Royal Highness the Prince of Wales acquainting him with the important nature of this meeting, and suggesting that His Royal Highness would be adding another to the many deeds of glory which have marked his career, by associating his name on this occasion with the peers of the realm of chemistry. (Loud applause.) His Royal Highness, however, very gracefully replied that, much as he appreciated the proffered honour, and constantly as the welfare of our Institute was "uppermost in his mind," he must abstain from taking part in gatherings of this kind during the season of Lent.

(The company here joined in singing the "Te Deum.")

The Chairman then said: I must next ask you to drink to "The Army, Navy, and Reserve Forces." Such a toast, at such a period as the present, needs, I am sure, no words from me. It is true that we have neither the Duke of Cambridge nor Admiral Hornby at our table; but, gentlemen, I venture to say, that when the history of our first campaign comes to be written, the fame of Professor Abel will outvie that of Wellington or Nelson. (Cheers.)

Professor Abel, in a humorous speech, briefly responded. His name, he said, was a misnomer. From his proficiency in the art of knowing how to destroy his fellow-creatures on the most extensive scale, his godparents would have been better advised had they given him the name of "Cain." He also desired to point out that the gentleman on his right (Mr. Gore) was more at home on the field of glory than he was.

Mr. George Gore, F.R.S., at the request of the president, then sang with great effect the new national anthem, "Here stands a Post."

The Chairman: It is with unbounded pleasure that I now rise to ask you to fill your glasses in honour of *the* toast of the evening, which I need hardly explain is "Prosperity to the Institute of Chemistry." (Vociferous cheering.) Gentlemen, I consider that the present occasion offers a fitting opportunity for a few remarks from myself with relation to the formation of this Institute. (Hear, hear.) We are, all of us, I fear, but too well aware that, outside our own favoured circle, there exists an ill-disguised feeling of envy and discontent. A lying spirit is abroad, whispering uncharitable things of the philanthropic project upon which we are engaged, and attributing other than the most disinterested motives to our laborious efforts to float this Institute successfully. (Cries of shame.) Now, gentlemen, let me remind you how this association originated. In September last I received a communication from the Board of Trade, intimating its desire to form a company for the protection of the interests and the advancement of the position of the consulting and analytical chemists of Great Britain and Ireland, and requesting my advice and active assistance in carrying out the proposal. Well, gentlemen, for a long time I was sorely puzzled as to the course it would be best to take. I could see that, for any society of the kind to be successful, it must be, in the first place, exclusive, and in the second, that its members must be bound together by some common tie. At length, gentlemen, a happy idea seized me. (Cheers.) By means of two thousand post cards I communicated with every member of the Chemical Society for the purpose of ascertaining the number and names of those chemists who employed the organic carbon and nitrogen process for the examination of potable waters. I received a courteous reply to each of my applications, and had the satisfaction to find that no less than sixteen professional chemists were in the habit of using the process referred to. Need I say that these sixteen gentlemen, with myself, were immediately registered by the Board of Trade as a limited liability company "to promote the Advancement of the Profession of Chemistry and to maintain the Profession of the Consulting and Analytical Chemist on a sound and satisfactory basis." (Great cheering.)

The toast having been duly honoured,

Professor Redwood, in response to loud calls, sang, with telling effect, a song which he had composed for the occasion. The first verse ran;—

> Come chemical lads, take leave of your "fads,"
>   And away to the Institute hie,
> For every care will vanish there
>   While Frankland's standing by.
> And Carteighe shall have his Way,
>   And Smith will find his Brown;
> And puff it, puff it, puff it, puff it,
>   Puff it up and down.

The Secretary (Mr. C. E. Groves), said that after the able and exhaustive speech of their President, he need not himself enter into any details respecting the reasons which led to the formation of the Institute. He desired, however, to offer a few remarks in reference to the malicious observations which were from time to time being made out-of-doors regarding the strict secrecy which the directors of their company maintained on all matters connected with its constitution, and its objects. He would in the first place remind them that every member of the Council had pledged himself by a most solemn oath not to divulge the motives which had induced him to join the Institute, and ever to preserve in public the most abject silence as to the policy and intentions of the executive. It needed but a slight acquaintance with history for them to perceive what an immense power was wielded in the political world by secret societies, and it was something akin to that authority for which they were craving. It would, of course, be necessary that members should have some means of identifying each other, and it had been suggested that, in masonic fashion, some sign, such as placing the fore-finger upon one side of the nose would be a convenient emblem of recognition. But after much deliberation they had decided that in future every member should, on admission, be branded with the initials M.I.C.E.* (Member of the Institute of Chemistry, England). He might add that Mr. Fletcher, of Warrington, was manufacturing for them a very powerful hot blast blow-pipe for the purpose. (Loud applause.)

Mr. Michael Carteighe, as one of the promoters of their Institute, in a speech which showed great mastery of detail, pointed out some additional qualifications which candidates for fellowship would in future be required to possess. They would have to produce a certificate of vaccination, countersigned by not less than three magistrates, and, amongst other things, give satisfactory evidence that they habitually consumed not less than three bottles of fluid magnesia per week.

Mr. C. T. Kingzett insisted that it should be a *sine quâ non* that candidates should also be prepared to prove that they were immediately before admission, thoroughly disinfected with "Sanitas."

Dr. C. R. Alder Wright was sure that no candidate was fit for election who had not published an original memoir upon the Aconite Alkaloids and their Derivates.

Professor Attfield, in a most pathetic speech, then proposed the last toast, "Absent Friends." There were many faces, the Professor remarked, whom they would have welcomed at their table, but who had not yet been brought to see the inestimable blessings which the Institute was prepared to convey. His heart ached to recognise as a friend the "Credulous chemist," and as for Dr. Muter, he could assure them he yearned to clasp him in a fond embrace. He would conclude by calling upon their President to respond to the toast.

The Chairman appropriately replied, and to the great delight of the company, sang to the accompaniment of the band, a touching melody, commencing—

"O Wanklyn, we have missed you."

After joining in the Evening Hymn, the company separated.

LAW REPORTS.

Diseased Milk.—A case under the Sale of Food and Drugs Act, of a somewhat different nature to those of late heard in the Greenwich district, came before Mr. Slade, on Tuesday. George Pring, cowkeeper, of Lee, appeared to answer two summonses against him, the first for selling milk with which there was a mixture of *pus* and blood, and the second for selling as milk an article not of the substance demanded.

Mr. Biron, barrister, appeared to prosecute on behalf of the Plumstead District Board of Works; Mr. C. J. Carttar was for the defendant. The first summons was taken under section 3rd of the Act, and the second under the 6th, but in regard to the former, the summons was subsequently amended. If the case had been proved under that section defendant would have been liable to a penalty not exceeding £50. The purchase of two lots of milk, the first on the 19th of March and the second on the 21st, was deposed to by Mr. R. J. Baker, an inspector under the Plumstead Board, and Mr. Wigner, Public Analyst, certified that it consisted wholly or in part of milk which had been obtained from a diseased cow, and that the milk had in consequence of the cow's disease become mixed and coloured with pus and blood corpuscles, so as to be utterly unfit for human food. Mr. Wigner stated in his evidence that he had examined the sample chemically, but had not found it either watered or skimmed, but as the sample when delivered to him had an unnatural red colour he thought it best to examine it at once microscopically, and on doing so he found a number of pus corpuscles and colourless blood corpuscles, a few coloured blood corpuscles, a large number of pieces of skin of epithelial matter, probably derived from the mammary glands, and a number of peculiar bodies, unnamed, but which are never found in ordinary milk. He also detected blood bands by the spectroscope. The cream of the milk was of an orange yellow colour, and speedily became covered with a growth of mould or fungus. Mr. Heisch gave corroborative evidence and Dr. Burton, medical officer of health for Lee and Kidbrooke, confirmed their testimony.

Mr. Carttar called evidence to prove that immediately the defendant ascertained that one of the cows was attacked with disease he sent for Mr. Indersoll, the veterinary officer, at Lewisham, who had the animal slaughtered, and that all the other cows were then and now healthy. Mr. Indersoll said they were a very good shed of cows, and some of them superior. As a rule when a cow was suffering from *pleuro pneumonia*, the disease the one in question was labouring under, it did not give milk. The evidence as to the second summons showed that there was not quite so much impurity in the milk as in the first case. Mr. Balguy said the colouring of the milk as shown must have taken place in the body of the cow. Mr. Carttar said that was no fault of the defendant's and it was not even suggested that water had been added to it afterwards. Mr. Biron said he was not prepared to prove that the defendant had caused the mixture to be made.

Mr. Balguy said in his opinion the defendant was guilty of not having exercised sufficient caution in examining the milk, and there was a case under the 6th section of the Act. He was not satisfied that either the defendant or his wife wilfully sold such milk. He must impose a punishment which would act as a warning to other cowkeepers. Defendant must pay a fine of 20s. on the first summons and £10 on the second, with costs of the summonses.

James Gobey, milk dealer, also of Lee, appeared to two summonses charging him with selling milk not of the substance demanded. Mr. Baker proved the purchase. The analyst was of opinion that the milk was from a cow that had recently calved or had an external wound on her udder. There was no water added. Mr. Daniel Phillips, farmer and cowkeeper, said he never had a cow milked until the fourth meal after calving. Mr. Fowler, cowkeeper, of Deptford, said sometimes one cow would tread on the udder of another, which would injure the milk. He believed that in the case of Mr. Pring the evil was owing to a diseased udder.

Mr. Balguy inflicted a fine of 20s. and 2s. costs in each case.

Singular Charge of Stealing Milk.—William Rockett, 35, was charged with stealing three gallons of milk, the property of his master, Lawrence Watson, on the 26th of February.—Mr. Smith prosecuted, and in opening the case said the prisoner was indicted for stealing three gallons of milk, but that was merely a nominal quantity, and the jury might possibly come to the conclusion that the quantity was less, but if they thought he had stolen any at all they could, of course, find him guilty. The circumstances of the case were rather peculiar and very important, both from a public point of view and also so far as the prosecutor was concerned. He resided at Middlesborough, but had agencies in Hull and several other large towns for the sale of the produce of his dairies. He also obtained good milk wherever he could, and, therefore, the case was important because it was necessary that the prosecutor should maintain his reputation for selling good milk. It appeared that he received several complaints as to the quality of milk sold in Hull, and he sent down an individual to find out who was practising the deception. The result of the investigation was that the police were communicated with, and on the 26th February the prisoner was watched after receiving the milk at the railway-station. He went home, and there he was seen to empty liquid of some kind into his can, and subsequently he added more. Samples were obtained after each adulteration, and on analysis were each found to contain a large proportion of water. The prisoner received pure milk, and returned a quantity adulterated with water, and it was the difference between what was received and returned that he was charged with stealing.—Mr. James Baynes, Jun., borough analyst, deposed to analysing the three samples of milk produced. The first sample taken at the railway-station only just came within the lowest limits of pure milk, and there was propably three or four per cent. of added water; No. 2 contained an additional 8½ parts; and No. 3 28½ parts of water.—There was really no defence, the prisoner acknowledging that he had adulterated the milk with water. The jury found the prisoner guilty. The prosecutor strongly recommending him to the merciful consideration of the Court.—Four months' hard labour.—*Eastern Morning News.*

NOTES OF THE MONTH.

It is a trite saying that in the best regulated families accidents will occur, but we wish for the credit of analysts generally that such mistakes in weighing as that to which Dr. Swete, of Worcester, has fallen a victim, were impossible. One great error seems to have been permitting a visitor to assist in his laboratory with official samples. We have always held that in such a laboratory no person should ever be permitted to be present in the room devoted to official work, except the analyst himself and his properly-paid and qualified assistants.

In another part we print the report of Dr. Swete, extracted from the *Worcestershire Chronicle*, so that analysts may have the opportunity of fully considering his defence. There is one point which we confess we do not exactly understand, and we suggest that in his own interest Dr. Swete should give some further explanations. He is reported to say:—"The old plan was to use platinum dishes, and to measure, not weigh, the milk. Finding that this plan gave a disadvantage to the vendors of milk, I adopted that of weighing the milk, and using porcelain dishes." How it is possible that such a disadvantage could occur we freely confess that we are not chemists enough to see, as it appears to be all the other way so far as the measuring is concerned. If a man takes, say 10 c.c. of milk as being 10 grammes, he really uses $10 \times 1{\cdot}030 = 10{\cdot}3$ grammes of milk, and therefore his resulting solids must be in proportion too high, and consequently in direct favour of the vendor; so in giving up measuring for weighing he apparently does exactly the contrary of what he intends. Again, the use of porcelain instead of platinum may be a measure of economy, but it certainly is not one of increased accuracy. Surely on this point the report has been incorrectly reported, or else specific gravity is not very clearly understood in some parts of the realm.

What a dreadfully benighted county Dorset must be, seeing that, according to a statement at the Quarter Session, it contains no analytical chemist, qualified, according to the Sale of Food and Drugs Act, to accept the office of analyst for the county! What a glorious chance for some of the "Peers of the chemical realm" who have been engaged in hatching the Institute, or some of the young lambs who have been secretly chosen into that happy fold. But tell it not in Gath, an awful idea is abroad that unfortunately the Local Government Board does not yet accept membership of the Institute as a qualification!

Whether telephones sometimes get a "little too much" when attending a dinner or not is as yet an undecided point, but the private one belonging to the *Chemist and Druggist* is a most amusing piece of apparatus. We reprint one of its reports for the entertainment of our readers, as being, perhaps, the nicest little piece of fun that the chemical world has had the chance of enjoying for some time. The poor Institute has had to stand a good deal, but to laugh at it in such a manner is really too bad, seeing that everybody has a right to make himself as ridiculous as he likes in this free country, even to the extent of dubbing himself and his friends chemists by limited liability.

Talking about the Institute, we were struck by a very deep allusion to *paraffins* in a letter by Dr. Attfield to a contemporary. There was evidently some awful meaning underlying it, and people have been going about and wondering mightily. Would it be too much to ask the learned Professor to explain the meaning, and so relieve the minds of those who, like ourselves, sit humbly at his feet ready to pick up and devour the crumbs from his intellectual table. We are, however, quite ready to agree with him that there are certainly chemists and chemists; and, furthermore, we say that the true sign of a really eminent chemist is an absence of jealousy, and a desire to keep in the background until forced forward, in spite of himself, by the greatness of his scientific work.

The great event of last month has been the election of Council at the Chemical Society. The scene at the meeting, when the alternative list was denounced was one of the most exciting that has been witnessed in the Society. We must say candidly that the issue of the alternative list was a great mistake. If any member or members desired to object to the nomination of the Council, they should have headed and printed their list so as to distinctly show that it was in opposition, and accompanied it with a circular stating their views. Even had no fault been committed in this respect the opposition was ill-judged, because the Chemical Society includes specially votaries of every branch of the science, and there can be no question of Mr. Carteighe's eminence in the particular line of pharmaceutical chemistry which he has chosen. We are the more entitled to unhesitatingly state this view, as we objected to his being on the Council of the Institute on the ground that if such an association was required it should be purely composed of analytical as distinguished from pharmaceutical chemists. Our opposition was theoretical and not personal, and we are pleased to see the right man when in the right place.

The latest piece of dirt is thus thrown by an obscure trade organ *apropos* of gin adulteration. "Recent decisions show that we ought to have the thing more clearly defined. At present the game seems being kept alive by an arrangement between the informer and the analyst, the latter of whom appears to get his fees whether the defendant is guilty or not." Suppose, for an instant, that the analyst only got fees when he had given a certificate under which a man was found guilty, what would the trade journals then say about a direct premium for prosecution? Having a bad case and abusing the opposing attorney is a very old affair, but if the abuse is to have any weight it must be something less senseless and absurd than the above. Surely the organ in question cannot have a very exalted opinion of the intellectual and reasoning powers of those whose interests (?) it professes to guard.

Dr. W. Morgan, Public Analyst for Swansea, has been appointed Public Analyst for Brecon.

THE ADULTERATION OF VIOLET POWDER WITH ARSENIC.

Correspondents in the *Lancet* having called attention to this somewhat extraordinary mode of adulteration, we have thought it our duty to institute a full inquiry into the matter; samples of violet powder have been obtained from various parts of the country, and we shall publish the results of our analyses in our next number.

ORGANIC MATERIA MEDICA.*

As the above book is the work of one of the Editors of this Journal, it would be obviously unbecoming in us to insert any review of it. We therefore content ourselves with saying that it has been entirely rewritten, and is carefully and completely indexed. As to all other points we must leave our readers to form their opinions, either from reviews in other journals or from the book itself.

RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
4553	H. Augustin (Schering's Patent)	Manufacture of Salicilic Acid	8d.
1877.			
3159	J. H. Johnson	Converting Hydrocarbons into Gas	6d.
3229	D. Machnie and W. Gentles	Manufacture of Sulphuric Acid	2d.
3323	C. Humfrey	Treating Phosphates for the Elimination of Alumina therefrom	4d.
3331	H. Garth and J. Ostler	Extracting Alcohol and Acetic Acid from Locust Beans	4d.
3387	E. P. Alexander	Manufacture of Sulphate of Alumina	2d.
3395	B. B. Standen	Treating Sewage, &c.	6d.
3429	M. J. Roberts	Lubricating Machinery	6d.
3439	J. H. and T. Butterfield	Steam Engine Lubricators	6d.
3445	F. J. Evans and W. T. Sugg	Manufacture of Coal Gas	6d.
3460	J. A. Ditch	Composition for Coating Substances to be used in lieu of Slate	2d.
3547	J. H. Johnson	Manufacture of Chloride of Lime	2d.
3571	J. Gray	Treating and Utilizing Sewage, &c.	4d.
3980	J. Von Quaglio	Purifying Coal Gas	4d.
1878.			
162	W. R. Lake	Producing and Applying Magneto Electricity	6d.

Wanted, an Analyst.—It was stated at the Dorset Quarter Sessions lately that it had been ascertained there was no analytical chemist in the county, qualified according to the Sale of Food Act, and who was willing to accept the office of analyst for the county. The committee appointed on the subject reported that any further search for an analyst be postponed until the October Quarter Sessions, because the appointment is to vest in the new County Government Board, as proposed by the Bill now before Parliament, and by that time the Court will be better informed on the matter. The report was adopted.—*Grocer.*

At the moment of going to press we deeply regret to learn that, on the 29th inst., Mr. William Baker, of Sheffield, fell over the banisters of his club and sustained very serious injuries. His forehead was fractured and the brain protruded; the bones of his nose were broken, and he was otherwise badly injured. He is in a very critical condition, but we are glad to hear there is a ray of hope of his recovery.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Medical Record; The Miller; The Anti-Adulteration Review; Journal of Applied Science; The Country Brewers' Gazette; Sanitary Reform, by Kenneth Macleod; A Manual of Microscopic Mounting, by J. H. Martin.

* Second Edition.—Simpkin & Marshall, Stationer's Hall Court, London.

THE ANALYST.

SOCIETY OF PUBLIC ANALYSTS.

A General Meeting of this Society was held on the 1st May, 1878, the president Dr. Dupré, F.R.S., in the chair.

The minutes of the previous meeting were read and confirmed.

Dr. Muter and Mr. Hehner were appointed scrutineers to examine the voting papers, and reported that Mr. Robt. E. Owen, of Beaumaris, had been elected a member.

Mr. J. W. Montgomery, of Whitehaven, public analyst for Cumberland, was proposed for election as a member, and Mr. E. G. Clayton, assistant to Dr. Bernays, as an associate; they will be ballotted for at the next meeting.

The Secretary read a paper by Dr. Campbell Brown, "On the Composition of Honey."

Mr. Wigner read a paper "On some recent cases of Diseased Milk," and

Mr. Heisch also read a paper "On Diseased Milk."

Dr. Muter read a short note "On Milk Preservation."

Dr. Dupré read a paper "On two analyses of Water drawn from the same well."

Mr. Wigner read a paper "On the work done by Public Analysts during 1877, under the Sale of Food and Drugs Act."

The next Meeting of the Society will take place at Burlington House, on Wednesday, the 19th June, at eight o'clock.

This meeting has been postponed from the 5th June on account of special business likely to come forward.

ON TWO ANALYSES OF WATER DRAWN FROM THE SAME WELL.

By A. Dupré, Ph.D. F.R.S.

Read before the Society of Public Analysts on 1st May, 1878.

A short time since I received from Mr. R. Field, the well-known sanitary engineer, two samples of water for examination. Both samples were drawn from wells situated close to the dwelling house which they supplied, at front and back respectively. Finding one of these waters to be very decidedly the best, I recommended that this only should be used for all culinary and other purposes. In reply to my report I was informed that the water I had recommended could not be used owing to the bad smell it evolved on boiling. or in the boiler, and that probably some mistake had been made in marking the samples. Accordingly I had a second sample of water from the well I had recommended forwarded to me, of which I need here only say that it proved conclusively that no mistake had been made the first time. When, however, I took about two pints of this water and raised it nearly to boiling it evolved, more particularly on shaking, a very offensive smell. Testing the smell of the water in my usual way, *i.e.*, by heating about five ounces of it to a temperature of 100° F., shaking up briskly in a wide mouthed bottle, and at once applying the nose, I still failed to detect any smell. No trace of sulphuretted hydrogen was present.

Here then was a water clearly unfit for domestic use, which analysis had nevertheless, as the figures given below will show, pronounced pure. This result puzzled Mr. Field not a little, the more so as he considered the whole surroundings of the well as exceedingly unfavourable. The case was also extremely unsatisfactory to myself, as

in the face of my analysis, confirmed by the second sample, I could not do otherwise than pronounce the water to be pure, barring the offensive smell evolved on boiling.

A few days later Mr. Field, who had meanwhile again visited and carefully inspected the place, an inspection which confirmed all his previous misgivings, informed me that the house to which the well in question belonged had not been inhabited for some months past, and that during such time little or no water had been drawn from the well. I therefore requested to be furnished with a third sample from the same well, which was, however, to be taken only after the well had been as far as possible pumped dry and then been allowed to refill itself. The analysis of this water, also given below, shows a considerable degree of pollution, and indeed proves the water to be unfit for domestic use. The offensive smell evolved on boiling was however, if anything, rather less marked in this than in the previous sample. How then is this striking difference in the character of the water drawn from the same well to be accounted for? It is, of course, well known that even very foul water left to itself, in tanks or barrels, becomes purified and fit for drinking in process of time, and I suppose that something similar had taken place in this case. The water, left undisturbed in the well for months, had undergone a gradual process of purification, aided perhaps by vegetation or by dilution with rain-water. Similar cases have, I believe, been observed by others, but I venture nevertheless to bring it before you as it emphasises far more strongly than any case I am acquainted with the absolute necessity of having a considerable quantity of water drawn from a well before the sample is taken for analysis. Had the water in the present case not possessed this, so to speak, accidental and minor character of smell, the well would have been considered good in spite of its surroundings and the misgivings of the engineer, and serious mischief might have resulted.

In conclusion, I may state that the well in question has a depth of seventeen feet with about eight feet of water. The upper part, down to within about half a foot of the water level, passes through vegetable mould, sand and gravel, the remainder is in the chalk. The well was closed in by a brick vault. The chalk in the neighbourhood of the well is penetrated by innumerable rootlets, and when broken up gives out a very offensive smell. Round these rootlets, many of which are decaying, the chalk is coloured black by sulphide of iron. A cesspool, now about to be filled in, is situated at a distance of about seven yards from the well, and a brick drain runs at about the same distance past the well, which latter I need scarcely add will also be filled up.

	First Sample.	Last Sample.
Appearance	clear	
Colour	pale greenish	
Taste	tasteless	
Smell	inodorous*	
Deposit	none	
Nitrous Acid	none	
Phosphoric Acid	very strong trace	
Hardness before boiling, ...	27·0 degrees (Clark)	
„ after „	9·5 „ „	
Oxygen absorbed from permanganate	0·014	0·035
	Grains per gallon.	
Total dry residue	37·80	
Consisting of { volatile matter	1·40 }	
Consisting of { fixed salts ...	36·40 }	
Chlorine	2·24	3·29
Nitric Acid (N_2O_5)	0·11	2·66
Ammonia	0·000	0·013
Albuminoid Ammonia	0·004	0·010

* This refers to the usual mode of testing it.

ON THE COMPOSITION OF HONEY.

By J. Campbell Brown, D.Sc.

Read before the Society of Public Analysts on 1st May, 1878.

There are so few analyses of honey on record that it seems desirable to bring before this Society a selection of analyses of authentic examples of genuine honey with which commercial samples may be compared.

The only detailed analyses of honey with which I am acquainted are those published in Hassall's "Food and its Adulterations," 1876, p. 266. But as they do not give the proportions of the different kinds of glucose, but only the total glucose, and are accompanied by the extraordinary statement (p. 274) that starch sugar is the adulteration, which it is scarcely possible in many cases to detect, they will not be of much practical value to the members of this Society.

The analytical determinations which are useful in the analysis of honey are the following:—

1. Estimation of the water of solution expelled at a temperature slightly over 100° C.
2. Water of combination and other volatile matter expelled only at a higher temperature; this may be sometimes safely estimated by difference.
3. Insoluble matter; pollen, wax, &c.
4. Microscopical examination of the honey, and especially of the pollen.
5. Estimation of the ash, if necessary.
6. Qualitative examination of the ash when the quantity is great.
7. Estimation by the polariscope saccharimeter of the action of a solution of known strength on the polarised ray.
8. The same after inversion.
9. Estimation of the total glucose by standard solution of copper salt.
10. A similar estimation after inversion is often useful as a check.

The result of 7, 8, and 9 give, by an obvious calculation, the proportions of dextro- and laevo-glucose.

The proportion of cane sugar is calculated from 9 and 10, or may be deduced by means of Clerget's tables from 7 and 8.

I have never been able to satisfy myself of the occurrence of cane sugar in honey; and I am by no means sure that the figures representing cane sugar in the following analyses, and in those of Dr. Hassall, do not really represent experimental error; my figures for cane sugar are calculated from observed results in which a very small observational error would give a difference of 1 or 2 per cent.

RESULTS OF ANALYSES OF AUTHENTIC SPECIMENS OF GENUINE HONEY.

	English.	Welsh.	Normandy.	German.	Greek.	Lisbon.	Jamaica.	California.	Mexican.
Water expelled at 100°	19·1	16·4	15·5	19·11	19·8	18·8	19·46	17·9	18·47
Water expelled at a much higher temperature and loss	7·6	6·56	4·95	11·	7·8	6.66	7.58	8·13	10·03
Laevulose	36·6	37·2	36·88	33·14	40·	37·26	33·19	37·85	35·96
Dextrose	36·55	39·7	42·5	36·58	32·2	34·94	35·21	36·01	35·47
Cane sugar (?)	doubtful.	none.	none.	none.	none.	1·2	2·2	none.	doubtful.
Wax, pollen, and insoluble matter	good trace.	trace.	slight trace.	trace.	·05	1· nearly.	2.1	good trace.	trace.
Mineral matter..................	·15	·14	·17	·17	·15	·14	·26	·11	·07

The specific gravity of honey is about 1·41, but varies slightly with the proportion of water.

The proportions of water are higher than might have been expected, but I have confirmed some of the above results by a combustion with oxide of copper.

The rotation of a polarised ray, produced by a solution of 16·26 grammes crude honey in 100 c.c. water, is generally from —3°·2 to —5° at 60° Fahr. The only one of the above samples which gave a higher rotation was the Greek honey, which gave nearly —5½°. The rotation produced by a solution of the same weight of dried honey is generally not far from —4°·8; but some latitude must be allowed until a larger number of observations have been made.

EXPERIMENTS ON THE DETERMINATION OF THE FREE ACIDS OF VINEGAR.

By Alfred H. Allen and R. Bodmer.

Read before the Society of Public Analysts, on the 20th March, 1878.

With the view of ascertaining the extent to which the known methods of determining the acids of vinegar could be trusted, we have instituted a series of experiments on representative mixtures of known amounts of the constituents of vinegar.

As a starting point, we prepared a pure acetic acid by distilling the commercial acid after addition of a little soda.

The distillate had a density of 1·0396 at 15° C. According to Oudemann, this number corresponds to 28·67 per cent. of real acetic acid ($C_2 H_4 O_2$), or, according to Mohr, to 29·5 per cent. The figures of the latter chemist's table of densities are only carried to three places of decimals.

Weighed (not measured) quantities of the above sample of acid were next titrated with decinormal caustic soda, using litmus as an indicator. The results shewed 28·54, 28·44, 28·49, and 28·59 per cent. of real acid, the average being 28·515. Another titration, in which a few drops of cupric sulphate were employed instead of litmus (a permanent turbidity being taken as the end of the reaction), gave 28·52 per cent. of acetic acid.* It will be seen, therefore, that the two methods of titration gave extremely close results, and that the amount of acid calculated from the density (by Oudemann's table) was slightly higher than that found by titration. This result is in accordance with the general opinion that titration of acetic acid gives results slightly below the truth.

A dilute acid was next made by mixing a quantity of the above sample with nine times its *weight* of water. A portion of it was then titrated, (using litmus), when it gave 2·853 per cent. of acid,—almost exactly one-tenth of the original amount. On the other hand the density was 1·0040, which corresponds to 3·20 per cent. of acid according to Oudemann, or 3·0 according to Mohr. Hence, the two parts of Oudemann's density tables are inconsistent. The fact that the part of the table referring to 28 per cent. acid gives results agreeing fairly with the titration method, while that referring to 3 per cent. gives discordant results, shews pretty clearly the direction of the error. It is, of course, impossible to ascertain the cause of the discrepancy with certainty, but it is worth

* Another sample of acid gave 27·27 as the mean of three titrations in which the end of the reaction was indicated by litmus, and 27·25 as the mean of three in which $Cu SO_4$ was employed. Hence, if there be an error of deficiency introduced by the use of litmus, the same objection applies to sulphate of copper, and probably other indicators.

notice that if one *measure* of acid at 29 per cent. were diluted with nine *measures* of water, the dilute acid would really contain 3·004 per cent., instead of 2·9 per cent. as might often be assumed.

These considerations have no relation to, and are in no way affected by, the well-known abnormal density of strong acetic acid.

On the whole, we considered that the real amount of acetic acid in the sample was represented most accurately by the result of the titrations, and therefore in the following experiments the acid used is regarded as containing 28·52 per cent. of real acetic acid ($C_2H_4O_2$). In all cases in which acetic acid was to be determined, a weighed (not a measured) quantity of the sample was employed.

A. The first process tried was the determination of free acetic acid in presence of free sulphuric acid, by adding excess of carbonate of barium, boiling well, filtering, and precipitating the barium from the filtrate by dilute sulphuric acid. The amount of $Ba\,SO_4$ found represents an equivalent amount of acetate of barium formed, and the weight multiplied by ·515 gives the acetic acid.

	$H\bar{A}$ Taken.	$H\bar{A}$ Found.
Expt. 1.	·447 grms.	·456 grms.
Expt. 2.	·397 „	·406 „

These experiments shewed, as was to be expected, that free acetic could be readily determined in presence of sulphuric acid. Unfortunately the method is useless in presence of sulphates and many other salts.

B. In this case, the above method was modified so as to render it applicable to the analysis of acetates, and to free acetic acid in presence of sulphates. A known weight of the sample of acid was neutralized with standard soda, and standard sulphuric acid added in *twice* the quantity necessary for the conversion of the soda into $Na\,HSO_4$.

The liquid was then distilled nearly to dryness, water added, and the distillation repeated. The distillate was treated with $Ba\,CO_3$, as in process A.

	$H\bar{A}$ Taken.	$H\bar{A}$ Found.
Expt. 3.	·548 grms.	·561 grms.
Expt. 4.	1·126 „	1·118 „

If sulphate of silver were added before distillation, the method would be equally accurate in presence of hydrochloric acid and chlorides. Phosphoric acid has sometimes been employed instead of sulphuric acid, and would, doubtless, be preferable in presence of sugar, &c.

C. The next process investigated was that for the determination of free sulphuric acid in vinegar, by precipitating the sulphates with alcohol.

An artificial vinegar was made by adding to dilute acetic acid some caramel, calcium sulphate, potassium sulphate, and a known quantity of standard sulphuric acid, in such quantity that the liquid contained about 6 per cent. of $H\bar{A}$, and 1 per cent. of H_2SO_4. 50 c.c. of the "vinegar" were evaporated to 10 c.c., and treated with 50 c.c. of rectified spirit. After standing, the precipitate was filtered off, washed with alcohol, and the filtrate diluted, the alcohol boiled off, and the free H_2SO_4 precipitated with barium chloride. By this process we obtained these results:—

	H_2SO_4 Added.	H_2SO_4 Found.
Expt. 5.	·536 grms.	·536 grms.
Expt. 6.	·536 „	·538 „

Hence, it appears that, provided sufficient alcohol be added, a very exact separation of free from combined sulphuric acid, can be effected. No $KHSO_4$ is formed.

A sample of commercial vinegar treated by the above method, shewed no free sulphuric acid, whilst it contained sulphates corresponding to no less than ·159 per cent. (= 111 grs. per gallon) of H_2SO_4. The same vinegar contained 63 grs. per gallon of chlorine. These results, given by vinegar of unknown origin, present a curious resemblance to those obtained by Letheby from the article manufactured by Messrs. Hill and Evans, of Worcester. These were:—

	H_2SO_4 (as sulphates.)	Cl.
In the Vinegar. ...	111 grs. per gallon.... ...	50 grs. per gallon.
In the Water. ...	119 „ „	48 „ „

Two experiments were next tried by adding to 50 c.c. of the above sample of commercial vinegar a known amount of standard sulphuric acid, and proceeding as before.

Expt. 7. For 0·268 grm., H_2SO_4 added, ·188 was obtained.
Expt. 8. „ 0·268 „ „ ·190 „

Hence, a considerable and nearly equal loss occurred in both cases, the mean being ·079 grms. Of this, ·062 is accounted for by the reaction of the sulphuric acid added, upon the chlorides present in the vinegar. The remaining ·017 grms. probably reacted on acetates or phosphates. The conclusion to be drawn from the experiments is that the alcohol method will shew the true amount of sulphuric acid *existing* free in the vinegar, but that will probably be less than the amount *added*. By adding sulphate of silver before concentrating, the result would indicate the total free mineral acid in terms of sulphuric acid. The process thus modified would be applicable to the determination of free hydrochloric acid.

D. We next examined the very convenient process of Mr. O. Hehner.* This is based on the fact that, while acetates are converted into carbonates on ignition, and hence yield an alkaline ash, sulphates and chlorides suffer no similar change. Mr. Hehner further proceeds on the assumption that the presence of acetates in the vinegar is incompatible with that of free hydrochloric or sulphuric acid in the original vinegar, and hence any alkaline reaction of the ash of the vinegar, by proving the presence of an acetate, negatives the possiblity of the presence of a free mineral acid.

It was to be expected that the evaporation to dryness and subsequent ignition of a solution containing acetic acid, free sulphuric acid, and a sulphate, would produce a non-alkaline ash, but the same result seemed by no means certain if a chloride were evaporated with a comparatively large quantity of acetic acid. In this case it was thought probable that the effect of *mass* would be observed, and that the large proportion of acetic acid would effect more or less decomposition of the chloride, with volatilization of hydrochloric acid and formation of an acetate.

To obtain information on this point we made the following experiments:—A solution of common salt, in which the chlorine had been determined by nitrate of silver, was evaporated with a large excess of acetic acid. In some cases the operation was concluded at dryness, in others the solid residue was ignited. In some cases burnt sugar was added. The chlorine in the residue was determined by nitrate of silver.

* See ANALYST vol. 1, p. 105.

Expt. 9. ·0504 grms. of Na Cl, evaporated to dryness with a large excess of acetic acid, gave a residue containing ·0496 grms. of Na Cl. Loss ·0006 grms.

Expt. 10. The same experiment repeated, gave absolutely the same amount of Na Cl before and after evaporation with acetic acid.

Expt. 11. The same operation, with subsequent careful ignition of the residue, showed a loss of ·0012 grms. Na Cl.

Expt. 12. The same operation as in the last experiment, but with caramel added, shewed a loss of ·0014 grms. Na Cl.

Expt. 13. Conditions the same. Loss = ·0014 grms. Na Cl.

It appears from these experiments that the decomposition of the salt is practically *nil*, by mere evaporation, but that on ignition there is a loss of 2 to 3 per cent. of the total chlorine present. As there can be no free acetic acid present to account for this loss, it is probably due to unavoidable volatilization of the chloride, rather than to its decomposition.

On the other hand, when chloride of sodium solution was evaporated with tartaric acid, and the residue ignited, 36 out of 54 milligrammes of salt were decomposed, or $\frac{2}{3}$ of the total quantity taken. We also evaporated common salt solution with excess of cream-of-tartar. By mere evaporation to dryness no decomposition of the chloride ensued. This result was to be expected, as even acid *sulphate* of potassium does not react on common salt at moderate temperatures. On *igniting* the evaporated mixture of sodium chloride and cream of tartar, slight decomposition occurred, in one experiment 3 milligrammes, and in another 4 milligrammes of common salt being decomposed, out of the 50 milligrammes added.

When a solution containing 50 milligrammes of sodium chloride was evaporated to dryness (but not ignited) with excess of citric acid, the residue gave a weight of AgCl corresponding to only ·0367 grms. of Na Cl, shewing a loss of 24·6 per cent. of the common salt taken.

These experiments have a bearing on the method of Mr. W. C. Young for the determination of mineral acids in vinegar.* His process consists in adding excess of $Ba\,Cl_2$ to a known measure of the vinegar. In a portion of this liquid the chlorine is determined. The rest is evaporated, ignited, and the chlorine determined in the ash. The difference represents the free mineral acid expressed in terms of Cl. Acid tartrate of potassium is, of course, a constituent of wine-vinegar, and its presence would cause the determination of mineral acid by the above method to be somewhat too low. The presence of free tartaric acid would quite invalidate the results.

As citric acid decomposes a chloride on evaporation of a solution containing it, it is clear that Mr. Young is in error in stating that his process "is of course applicable to lime-juice or lemon-juice."

Mr. Hehner's method of determining free mineral acids in vinegar, is dependent on the alkalinity of the ash of the vinegar as compared with the amount of alkali added to the original liquid. "If we add to a measured quantity of the vinegar a known and exactly measured volume of decinormal soda solution, somewhat more than would be necessary to neutralise the total amount of free mineral acid present, evaporate and incinerate, the alkalinity of the ash gives the measure of the quantity of the free sulphuric or hydrochloric acid." The author's test experiments are very satisfactory.

* See Analyst vol. 3, p. 163.

It is evident that the amount of alkali added must be sufficient to combine with the fixed organic acids present, in addition to the mineral acids.

If the amount of alkali employed be insufficient, it is necessary to recommence the experiment. For this reason, and from the desire to determine the free acetic and the mineral acid in the same portion of vinegar, we have made some experiments in which enough normal soda was employed to neutralize the whole of the acid, the subsequent manipulation being unchanged. As the amount of alkali used was about 20 times as great as that employed by Mr. Hehner, the tendency to a slight error in the titration was greatly increased, but the following results show that this modification of the process is capable of all desirable accuracy.

An artificial vinegar was made by mixing acetic acid, potassium sulphate, caramel, and a known amount of standard sulphuric acid. A slight excess of standard soda was added, the liquid evaporated, the residue ignited, the ash dissolved in excess of standard acid, and titrated back with alkali.

Expt. 18.	For ·2736 H_2SO_4 taken, ...	·2695 was found.
Expt. 19.	„ ·2735 „ „	·2755 „

The commercial vinegar already mentioned as containing sulphates equivalent to 111 grains per gallon of sulphuric acid, in addition to 63 grains of chlorine, when examined by this process, showed a small *minus* quantity of free sulphuric acid*—a result fully confirming the alcohol determination.

Another experiment was made by adding a definite amount of standard sulphuric acid to 50 c. c. of the above commercial vinegar, and then proceeding as before, when we obtained :—

	H_2SO_4 Taken.	H_2SO_4 Found.
Expt. 21.	·1220 grms.	·1157 grms.

Hence the process gives fairly accurate results in actual practice. As, however, a small error in the amount of alkali and acid used causes a sensible difference in the result, it is preferable to add (as recommended by Mr. Hehner) only a fraction of the total alkali which would be required for complete neutralization. Under these circumstances, decinormal solutions can be conveniently employed, and hence greater accuracy in the results obtained.

It will be observed that in Expt. 21 nearly the full amount of sulphuric acid added is accounted for. Of course the result is really a determination of the free mineral acids (actually *existing* in the vinegar) expressed in terms of sulphuric acid, for theoretical considerations and the results of experiments 7 and 8 (made on the same vinegar by the alcohol process) show that a considerable proportion of the free acid was hydrochloric acid. In short, Hehner's process determines the total amount of free mineral acid, while the alcohol process,—with the use of sulphate of silver if necessary—enables the relative proportions of the free mineral acids to be ascertained. Hehner's process is in our experience, decidedly the most convenient and accurate in general use, and furnishes a valuable solution of a somewhat difficult problem. R. Warington has employed the same plan for the determination of free sulphuric acid in citric acid liquors, and the same principle has been frequently made use of.

* A *minus* result is very common with vinegars containing no free mineral acid, and, when beyond the limits of experimental error, is clearly due to the presence of acetates or other organic salts (*e.g.* malates, lactates, tartrates.)

REVIEW.

MICROSCOPIC MOUNTING.*

After a careful perusal of Mr. Martin's manual of microscopic mounting we find therein points for both praise and disapprobation. As it is always most pleasant to be able to approve of any portion of a work, we do the praising first. It is an excellent gathering together of useful mounting formulæ, and gives a good description of manipulation, but there the praise must end, as the matter imported into the work on adulteration, &c., and the drawings illustrative thereof, do not partake of the useful nature of the portion already alluded to. Had the book been published simply as a collection of well-established formulæ for mounting liquids, with the directions for use, it would have been a most convenient work, but the "padding" in which the autho seems to sometimes get out of his depth, spoils the book in its present form.

Let us justify these remarks by shortly glancing at a few matters. On page 2, *et seq.*, we are given a list of apparatus required, and are told that "the student must also add, buy, or make, as convenient to him, the following articles": Then follows a list, extending over two pages, of no less than 95 distinct articles (including chemicals), commencing with "an air pump," and ending with "pill-boxes, small pins, cardboard, &c., &c.," although what on earth the &c., &c., can stand for, we are at a loss to conceive, seeing that we find such sundries as "old knives" and "Liebig's extract of meat jars" already enumerated. We fear that if an ordinary knowledge of the microscope could not be got without procuring all this formidable list of articles, students would be much alarmed at the prospect. Again, on page 51, we have a drawing which is supposed to represent the method of making a bottle in which insects can be killed by the exhalation from laurel leaves, but the artist cannot have carried out the author's intention, as the quantity of leaves are so ridiculously minute that they would be quite inoperative. On page 27 we have an illustration of a retort with a flask-receiver, in a basin, presented as a specimen of "apparatus for making gases, distillation, &c.," but as there is no appliance for keeping the receiver cool, the latter process would be somewhat difficult. On page 161, we find that some granules, "by their globular character, are known to be wheat starch." Now, any microscopist knows that the special feature of the wheat granule is its flatness and want of globularity. Again, on page 175, when the author drops into chemistry, we find that the method of examining cayenne for the presence of vermilion and red lead, is to ignite it to ash on platinum foil, and test what remains on the foil for the metals. Now, we have always thought that vermilion was volatile by heat, and that an oxide of lead, mixed with organic matter, suffered reduction when heated, and then generally went right through the foil, but perhaps it is the residue on the ceiling of the room, or on the table, that the author meant to indicate.

It is, however, when we come to the drawings of food adulteration that the worst point of the book appears, because they are really so out of proportion that comparison is simply impossible. In plate 10 we have pepper, with the particles representing the starch drawn as an almost imperceptible powder, while in plate 11 rice starch is figured with a diameter of nearly a quarter of an inch in some

* A Manual of Microscopic Mounting, by J. H. Martin. London: Churchill & Co.

granules, the former being stated to be magnified 50, and the latter 450 diameters. Now, rice starch being simply twice the size of pepper, it follows that the relation of the drawings should be as 1 to 10, whereas here they are as 1 to 50 nearly. When we say that, as to the rest of the drawings, they are made under such a low magnification as to be practically useless, even with the author's direction to examine them by a lens, and that wheat starch is shown in plate 11 covered with highly-marked perfect rings, while in plate 10 it appears exactly like oil drops, we have said enough.

In conclusion, we say, let Mr. Martin, in his next edition, cut out all his "adulteration" and "chemistry," and publish simply his really good collection of recipes and directions for mounting, and all will be well. We should also, in the interests of professional dignity, advise him to cut out the advertisement page in which he announces that "he has a great and varied experience, both in microscopy and chemistry, and can be consulted, &c." However great and varied Mr. Martin's experience may be, he should not be the one to announce it in this way.

NOTE ON MILK "PRESERVATION."

By Dr. J. Muter.

Read before the Society of Public Analysts, on 1st May, 1878.

I have, since the last meeting of the society, had in my hands some samples of a fluid sold for the "preservation" of milk. Its specific gravity is 1,055, and it contains:—

Borax	6·6
Potassium carbonate	1·7
Sugar	2·5
Water (ordinary London)	89·2
	100·0

It is not very carefully made, and is not always quite alike, but it is evident that under the name of "preservation," adulteration is clearly intended. The fluid is to be diluted with so much water, and then added; and it is plain that a considerable amount of water may thus be introduced, which would not be detectable by the ordinary "solids not fat" process. If milk adulteration advances in the scientific manner it has done lately, analysts will be obliged to make a full estimation of every constituent, instead of depending on the present process. It would be interesting to know the effect of continued small doses of borax upon infants living solely on such "milk."

NOTE ON ALUM IN BREAD.

By A. Wynter Blyth, M.R.C.S.

Read before the Society of Public Analysts, 20th March, 1878.

I have found a small percentage of alum in the crust of certain bread, and only the usual minute quantity in the crumb.

I understand from the trade that bakers use a strongly alumed flour technically called "cones." This flour is not made into bread, but is used as it were to *face* the loaves. I have not seen any mention of this in works I have access to.

The hint may be valuable to my brother analysts, as it points to the advisability of making a separate analysis of the crumb and crust.

THE MILKMEN AND THEIR ANALYST.

THE *Dairyman* for May, in reporting the Annual Meeting of the Metropolitan Dairymen's Society, prints the report of the analyst to the society, which is as follows :—

DR. REDWOOD'S ANALYTICAL DEPARTMENT.

17, Bloomsbury Square, London, W.C.,
1st May, 1878.

DEAR SIR,—From May 31st, 1877, to April 30th, 1878, I received from members of the Metropolitan Dairymen's Society 428 samples of milk for analysis, of which 206 were unadulterated, the remainder consisting of 109 samples adulterated with less than 10 per cent. of water, 73 samples with more than 10 and less than 20 per cent. of water, 30 samples with more than 20 and less than 50 per cent. of water, 1 sample with more than 50 per cent. of water, and 9 samples which had been skimmed.

Yours truly,
To Fred. Morrison, Esq. T. REDWOOD.

The accounts of the society, which are also published, only interest us by containing the following item :

"By Honorarium to Dr. Redwood for acting as Analyst, £5 5s."

By the advertisement of the society which appears in another part of the same journal, it is stated that Dr. Redwood "is paid an honorarium by the society, and has agreed on payment of *two* shillings for each sample" (we presume of milk), "and on production of the card of membership, to send a certificate by post in about twenty-four hours after receiving the sample, which shall determine (*sic*) the specific gravity, total solids and fat, proportion of water, if any (*sic*) together with his opinion of the milk." Perhaps it is hardly necessary to state that the word "two" is italicized in the original advertisement.

Dr. Redwood, therefore, having analysed 428 samples of milk, of which 222 (though they all we suppose came from milkmen, dairymen, or cowkeepers), were adulterated, received the sum of almost but not quite two shillings and three-pence per sample. We reprint this as it may perhaps be a guide to other analysts who may be in doubt as to the fee to be charged for milk analysis. We understand that many leading chemists in London and elsewhere are in the habit of charging one guinea per sample, and we can only express a hope that the Institute of Chemistry, of the council of which we are informed that Dr. Redwood is a member, will decide which of these two is the proper professional fee, and so prevent what appears to be such a serious discrepancy.

CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

THE SELBY FLOUR CASE.

To THE EDITOR OF "THE ANALYST."

SIR,—In March last I condemned a sample of flour for containing "about half the usual quantity of alum." Before the case was heard at Selby, the defendant induced the magistrates to order a portion of the remaining part of the sample to be sent to Somerset House. The result was that the gentlemen occupying the position of chemists at Somerset House sent a certificate stating that they found the sample to contain an amount of alumina equivalent to 21 grains of ammonia-alum per 4lb. of the flour, that their experiments on pure flour had shewn an amount of alumina natural to flour varying from an equivalent of 2 to 10 grains of alum, and that, with regard to the excess of alumina found, "the results of their experiments did not enable them to affirm the existence of alum."

This certificate is interesting to chemists, as throwing light on the views of the Inland Revenue Chemists on a subject on which they had hitherto been silent. In the sequel some further information was elicited. Mr. Bell received a subpœna to attend and explain himself, but sent his colleague, Mr. Bannister, instead. Mr. Bannister explained that the alumina had been determined by Dupré's method. The opinion that the excessive portion of alumina was not due to alum was based on an experiment made in some way with logwood, Mr. Bannister shewing a residue dried up at the bottom of a porcelain dish

in confirmation of his statement. It also appeared that some of the Somerset House Chemists had made a series of experiments with pure flours with and without the addition of alum.

On the other hand, I had found an amount of alumina corresponding to 19½ grains of alum per 4lb., a result with which the determination at Somerset House agreed well. But there was this difference. As stated in evidence. I had dissolved the ash in HCl, and filtered, before evaporation to dryness to separate silica. By proceeding thus, and omitting the fusion with alkaline carbonate, I believe I leave any silicate of alumina insoluble. I have repeatedly analysed flours and wheat by this method, and have never obtained more alumina in solution than corresponds to 3 grains of alum per 4lbs., although on fusing the insoluble matter with alkaline carbonate more alumina may be extracted. This view I expressed at a meeting of the Society of Public Analysts, an account of which appears on page 8, of vol. i., of the *Proceedings* but my observations are reported as if I were at the moment referring to Dr. Dupré's process, whereas, in quoting these figures, I was referring to a process which I have had in frequent use before and since, and in which the fusion is omitted. I fully believe that Dr. Dupré's method is the best for the estimation of the *total* alumina, but by using acid alone, followed by filtration, I think it is possible to discriminate between *added* and *natural* alumina, or between soluble and insoluble. Such a plan has the disadvantage that *incomplete* solution of the alumina of the alum may cause an error of deficiency.

In addition to the estimation of alumina I had observed the absence of excess of iron, and had determined the ash. I had also had a portion of the flour made into bread, and tested by the logwood and ammonia test. It was a weak point that I had not been present when the bread was made, but the servant who made it was present ready in Court to swear that she used yeast and water only. (The water is a pure moorland water, containing 5 or 6 grains per gallon of solid matter.) The result of my logwood test on the bread was the production of a distinct, but not very well developed, blue colour. That the Somerset House Chemists failed on the flour, I contend, is due to one of two things—either faulty manipulation and inexperience, or the occasional tendency of the test to fail when applied to flour. It has certainly failed in my hands, and Hassall condemns it on the same account. Hence, as the Somerset House Chemists fail to obtain the logwood reaction, and ignore the teachings of the alumina, any sample of bread or flour, however much alum it contains, is liable to get reported pure if referred to Somerset House.

As to the amount of alumina natural to wheat, Dr. Dupré, Dr. Muter, Dr. Stevenson, Mr. Wanklyn, Mr. Wigner, and others agree in finding a maximum even less than that of Somerset House, though, probably owing to differences of process, they found more than I have done. A Mr. Reynolds, a druggist, of Leeds, asserts that he found a considerable proportion of alumina in Egyptian wheat some fifteen years since. Without wasting time by criticising this statement, I may say that another recent case, in which a high amount of alumina was found, is undoubtedly to be explained by the process employed. Thus, if the calcium and magnesium phosphates are at once precipitated by soda, and the phosphate of aluminium merely recovered from the filtrate, the weight of the latter will be seriously in excess of the truth. If the analysis be conducted in that way the phosphate of aluminium ought always to be redissolved, and precipitated from a cold solution containing free acetic acid.

The result of the Selby flour case was that the magistrates dismissed the summons but allowed no costs. I may add that the same defendants were summoned for another sale of flour, in which I certified to 10 grains of alum per 4lbs., described this amount in my certificate as insignificant, and wrote a letter to the authorities stating that they must not prosecute, for though my own opinion was decided as to the presence of alum, the proportion was too small for a conviction. I presumed this recommendation had been acted on, until I was informed that the sample had been sent to Somerset House.

I write this letter chiefly with the view of raising a discussion on the detection of alum in flour and bread, especially with reference to the logwood test.

I am, &c.,

ALFRED H. ALLEN.

SHEFFIELD, *May*, 1878.

THE BROMSGROVE MILK CASE.

To the Editor of "The Analyst."

Sir,—I did not use porcelain dishes for "economy" as my report shows. I used platinum for total solids and ash, but porcelain for the determination of fat. The reason why I considered the use of platinum as an injury to the dealer was that the residue in platinum soon became very hard and dry, and I found I could obtain a larger percentage of fat by the more slow evaporation in porcelain dishes.

The whole matter has been a great grief to me, but I have the satisfaction of knowing that the publicity given to the case (which cannot but be of injury to myself) has completely exonerated the milkseller from blame.

My laboratory is detached from my house and under lock and key, and no one is permitted to be there except in my presence. My friend, who unfortunately made the mistake in the tare of the dish had assisted me some time before in an extensive series of milk analyses, and I thought him quite competent in the use of the balance.

I made two analyses which agreed with each other of the milk before I made my report, but unfortunately used the same tared dish.

Yours faithfully,
HORACE SWETE, M.D.,
Analyst, Worcestershire.

May 23rd, 1878.

HOUSE OF COMMONS.

May 23rd, 1878.

SALE OF FOOD AND DRUGS ACT IN SCOTLAND.

Mr. W. HOLMS asked the Lord Advocate if he was aware that by a recent decision of the High Court of Justiciary the Sale of Food and Drugs Act, 1875, had practically become inoperative in Scotland; and, if so, what steps he proposed to take to remedy that state of things.

The LORD ADVOCATE said his attention had been called to the decision in question. The result of that decision was rather too strongly put in the question. It only affected the sixth clause of the Act, but he admitted that it would have the practical effect of stopping those prosecutions. The Act, however, was one which applied to England as well as to Scotland, and the same point which had been decided by the High Court of Justiciary had been raised by an appeal from a decision of the magistrates of Sheffield. He understood that that appeal was now pending before the Courts in this country, and he thought it would be better before taking action in the matter to wait and see what the judgment in that case might be.—*Times.*

May 27th, 1878.

SELLING SPIRITS UNDER PROOF.

Mr. SCLATER-BOOTH, in answer to Sir F. Perkins, who asked whether the attention of the Government had been directed to prosecutions which had been instituted against licensed victuallers for vending spirits of different degrees of strength under proof and the conflicting decisions of local justices on the point, said: The attention of the Government has, from time to time, been directed to the prosecutions which have been instituted against licensed victuallers for selling spirits of different degrees of strength under proof. The policy of the Sale of Food and Drugs Act was to leave it to the local tribunals to give decisions in accordance with the evidence in each case, and, in order to provide against the inconvenience which might result from varying views among the locally-appointed analysts, it was provided that the opinion of the Commissioners of Inland Revenue might be taken in disputed cases. I have no reason to doubt that in course of time, by this means, and by the decisions of the High Court of Justice on typical cases brought before them on appeal, greater uniformity of procedure will be arrived at. Meanwhile I may say that the statements and facts submitted to me tend to show that there is a natural process of deterioration in the strength of spirits by lapse of time, which should caution local authorities against the institution of proceedings in doubtful cases, and that there is a margin between the degree of about 17 per cent. under proof, which may be taken to be the figure at which spirits are delivered over to the licensed victuallers, and the point or points at which the Superior Courts have supported convictions within which at present some uncertainty must be admitted to exist. There are difficulties in the way of fixing a specific standard, and Parliament has not thought it proper to insert any such in the Act; but means are provided by which, in doubtful cases, retailers of these articles can protect themselves from prosecution, either by retailing under warranty or by labelling the article sold as of a particular degree of strength below proof.—*Times.*

ANALYSTS' REPORTS.

Mr. J. H. Collins, County Analyst for Cornwall, reports that in the quarter ended Lady-day he analysed six samples, including lard, bread, milk, gin, and beer. With the exception of two samples of gin, all were pure. The gin was diluted with water, one being 27½ per cent., and the other 34½ per cent. under proof; but he was not aware of any undeviating legal standard of strength for gin, and he could not say whether the legal or reasonable limits of dilution had been exceeded.

Mr. Blyth, County Analyst for Devon, in his quarterly report, presented at the Easter Sessions at Exeter, stated that during the quarter he had analysed five samples of beer, four of butter, two of tea, one of flour, one of pepper, one of gin, one of brandy, and four of milk. Three of these samples were adulterated—namely, two of the samples of milk had been watered, and from another a portion of the cream had been taken.

The report of Mr. W. W. Stoddart, County Analyst, to the Somerset Quarter Sessions, stated that he had made 273 analyses of food and drink, 270 of which had been submitted by the police authorities and three by the public themselves. Forty-one samples were found to be adulterated, and amongst these was one of "fictitious claret," which was evidently a most unwholesome beverage.

LAW REPORTS.

Hammersmith.—Adulterated Butter.—John Walker, a wholesale dealer, of the Goldhawk Road, Shepherd's Bush, was summoned for selling adulterated butter. Mr. Webb appeared for the defendant, who did not attend. Mr. Jones, clerk of the Fulham Board of Works, attended in support of the summons, and produced the certificate of the analyst, stating that the sample was composed of 75 parts of foreign fat. The inspector, who bought the butter, said he saw a tablet hanging in the shop stating in effect, that all butter sold there was pure. Mr. Webb produced a tablet which stated that all butter sold in the shop was not pure. The inspector said that was not the tablet he saw. Reference was then made to the wrapper of the butter, Mr. Webb stating that it bore a stamp notifying that the butter was a compound. The paper was inspected, but it was found not to bear a stamp. Mr. Webb said the defendant used a stamp of that kind. His neighbours sold the compound, and he was obliged to sell it. Mr. Bridge said it was a bad case, as the defendant was a wholesale dealer. He fined the defendant £15 and 12s. 6d. costs.

Wandsworth.—Sham Butter.—Edward Gould, of Clapham Park Road, was summoned for selling to Samuel Hallen Smith, the inspector appointed by the Board of Works for the Wandsworth District under the Adulteration of Food Act, butter which was not of the nature and quality demanded. It was shown by the certificate of Dr. Muter, that the so-called butter was animal fat manipulated so as to resemble butter. Defendant was fined £10, and 12s. 6d. costs. George Nicholls, of Clapham Park Road, was summoned for a similar offence. The defendant, who said the stuff was not sold as butter, was fined £10 and 12s. 6d. costs, which he immediately paid.

Greenwich.—Adulterated Butter.—Henry Alexander Thompson, of 457a, New Cross Road, Deptford, was summoned by the Greenwich District Board of Works, for selling an article of food, butter, which was found to be adulterated. Evidence was given, showing that Mr. Maslen, inspector of the Deptford district, purchased a half pound of butter marked at 1s. 4d. per pound. On paying for it he asked the manager, who served him, to divide the butter into three parts, as it was bought for analysis. A certificate was now produced, received from Mr. Wigner, which set forth that the article analysed contained more than 90 per cent. of foreign fat, and rather less than 10 per cent. of butter, which was not necessarily injurious to public health. The defendant's manager said he believed that on being asked to describe the butter sold he said it was not butter but "butterine." The inspector said that no such intimation was given, and the entry he had made in a book at the time showed that he (the manager) was reserved, and did not say anything. He added that subsequent to the analysis being made, in passing defendant's shop he told the manager the analysis was against the article, and "butterine" was then mentioned. Mr. Slade said the defendant had rendered himself liable to a penalty of £20. There would be a fine of 40s. and 2s cost of summons.

Manchester—Lard Appeal Case.—An important case under the provisions of this Act was decided on Saturday last by the Lord Chief Baron and Baron Pollock. It was an appeal from the decision of the Manchester bench of magistrates, who declined to convict the respondent under the above Act for selling one pound of lard, which was found on analysis to contain 15 per cent. of water. The contention before the magistrate was that Hopley had sold Rook the lard in the same condition as he himself had bought it, and that under the 25th section of the Act he was entitled to an acquittal. The magistrates refusing to fix a fine, their decision was appealed against, hence the present trial. Both judges concurred in the following statement made by Baron Pollock. "Is the thing sold prejudicial to the purchaser, and not of the nature demanded? I think both, though I do not mean that it is calculated to poison him, or interfere with his health." From this it follows that it is not necessary to prove that the adulteration is injurious to health, but simply that the article sold is "not of the nature demanded." The magistrates' decision was, therefore, reversed, and a fine inflicted.—*Medical Examiner.*

THE ALLEGED ADULTERATION OF FLOUR AT SELBY.

THE adjourned hearing of summonses against Messrs. John Croysdale and Sons, flour millers, Whitley Bridge, near Pontefract, who also occupy flour stores at Selby, for having sold flour alleged to be adulterated with alum, took place at the Selby Petty Sessions yesterday, before Mr. B. Hemsworth (chairman), Mr. W. T. Smith, and Mr. J. Adams. The defendants were summoned on two separate informations under the Sale of Food and Drugs Act, 1875, for having sold flour mixed with alum, in one sample equal to 18 grains of alum to four pounds weight of flour, and in another sample to ten grains of alum to four pounds weight of flour. Superintendent Gill, the officer appointed under the Act, prosecuted; and Mr. Heaton Cadman, barrister (instructed by Messrs Arundel and Son, Pontefract), appeared for the defendants. The case was reported in the *Mercury* when before the Court a week ago, and it may be remembered that a certificate from Mr. A. H. Allen, county analyst, was read, giving the result of his analyses of two samples of defendants' flour, as set forth in the informations. A report was also read from three of the analysts at Somerset House, giving the result of their analyses of the same samples, which was to the effect that the sample marked 29 contained alumina equivalent to 9-9-10ths grains of ammonia alum, and the sample marked 30 contained alumina equivalent to 21-1-10th grains of ammonia alum per four pounds of flour. Sample 29 according to their experience contained no more alum than was found in genuine flour, and with regard to the excess of alumina in number 30, the results of their experiments did not enable them to confirm that it existed in the flour in the form of alum. When the case was called on,

Mr. Cadman said that at the previous hearing of the case, in course of conversation with respect to the report from Somerset House, it was stated by one of the magistrates that if Mr. Allen's certificate had been sent to the analysts there they would have used the word alum distinctly instead of alumina. Mr. Smith remarked that what he said was that Mr. Allen's certificate had not been sent to the analysts at Somerset House, or they might have used another name. Mr. Cadman said that at any rate the gentlemen engaged in the prosecution of this case had not the common honesty to tell them that a copy of Mr. Allen's certificate had been sent to the authorities at Somerset House, and he now asked for the letter that was sent to be read. Mr. Hemsworth deprecated any imputation against the prosecution, as he was sure that Superintendent Gill had no feeling against the defendants. Mr. Cadman: I ask again, was a copy of Mr. Allen's certificate sent to Somerset House? Superintendent Gill: Undoubtedly, in accordance with a letter which I will read to you.

Mr. Cadman said that at the former hearing it was certainly the impression of the Bench that merely a sample of the flour was sent to London, with a request to the authorities there to make a report on it. Now it seemed that a sample had been sent, together with the report of Mr. Allen. The authorities at Somerset House were either to corroborate Mr. Allen's report or repudiate it, and they said, "The results of our experiments do not enable us to confirm that it (the alumina) exists in the form of alum." He wished to know whether a letter had been received from Somerset House since Monday last.

Superintendent Gill said that he had got a letter on the previous day. He explained that he had sent to Somerset House particulars of Mr. Allen's analysis, in accordance with a request from the analysts there. Since the last hearing he also sent a letter to Somerset House, to which he received the following reply:—

"With reference to the preceding letter, we have to state:—First. We are of opinion that the samples did not contain alum, and we intended this to be understood by the terms of our certificate. Second. Both samples were very limited in quantity, that marked No. 30 barely weighing five ounces. Although we were enabled, with the quantity at our disposal, to prove by duplicate experiments the presence of an excess of alumina in No. 30, and to satisfy ourselves of the absence of alum in both samples, it would have been more satisfactory to us to have had a larger quantity, that we might have been able to determine and state in our certificate in what form the excess of alumina existed in No. 30 flour.—(Signed), J. BELL, R. BANNISTER, and H. J. HELM."

Mr. Cadman said that the defendants had been brought into court to answer a charge of adulterating their flour with alum, and the analysts at Somerset House had certified that there was no alum present in it. That being so, was it necessary longer to take up the time of the Court? The defendants would not have been charged, but for a mistake on the part of Mr. Allen, and because of an inaccuracy in his tests of analysis. Mr. Smith thought they should hear further evidence. It seemed to him as if the analysts at Somerset House were persons who were not chemists, and were simply creating confusion. He thought, on the other hand, that Mr. Allen had given his evidence in a proper and straightforward manner.

The cross-examination of Mr. Allen, the analyst, by Mr. Cadman, was then resumed. He stated that he first tested the bread he had made from the sample of flour sent to him by the logwood test, which told him that there was something wrong with the flour. Having found this, he then ascertained the amount of alumina it contained by a process he had already described.

Mr. Cadman: To put it shortly, you found something wrong by one test; by another test you found what you call an excess of alumina, and then you put the two together and calculated alum. Is that so? Yes.

Mr. Cadman: Did you by any process you used find one speck or tittle of alum as alum? No, nor nobody else. Nobody ever found alum in bread as such.

Mr. Hemsworth : The analysts at Somerset House agree as to the alumina, but they don't say in what form it is. We want to know their opinion as to what that excess is. There is a property in the flour which ought not to be in it. Mr. Cadman: That excess of alumina might arise from the process of manufacture, and that being so, under the words of the section the defendants cannot be convicted. They had heard that Egyptian wheat was very dirty. Well, the defendants had special machinery for scrubbing and washing the wheat. They brushed it to take off every bit of clay, but if any specks remained it might be sufficient to account for the presence of alumina.

Mr. Richard Bannister, one of the analysts at Somerset House, was then called by Mr. Cadman, at the request of the Bench. His evidence was to the effect that the result of his and his colleagues' analysis of the flour was the same as Mr. Allen's, but they came to different conclusions as to the excess of alumina. Mr. Allen said it existed in the form of alum, but they found that it was not alum.

Mr. Hemsworth : Then what is it? I am sorry I cannot tell you.

But there is something in the flour that ought not to be? There is more alumina, but it may come from clay or dirt, or something which we are unable to say.

Mr. Allen, in answer to the Bench, said he still maintained his belief that there was alum present in the flour. At the same time Mr. Bannister was quite justified in what he had said, because he had failed to get the precise result which he (Mr. Allen) got. He had the authority of Dr. Hassall that the logwood test sometimes failed.

Mr. Bannister said that at the time they tested the samples sent to them they also tested 20 other samples of what they knew to be pure flour, and the result in all the cases was the same. They then added alum to some samples, and the test showed when the alum was present; so that he thought they were justified in concluding that the test was a good one.

After this evidence, the magistrates retired and consulted, and on their returning into court, Mr. Hemsworth said that they had thought the matter over, and found the evidence so conflicting that they had decided to dismiss the information.

Mr. Cadman said that had the bench not thought it right to dismiss the charge at that point, he would have called witnesses to prove that it was impossible for a miller to put alum into the flour. Mr. Hemsworth : Let's say no more about it. Mr. Cadman applied for costs, but the bench would make no order.—*Leeds Mercury.*

Arsenic in Violet Powder.—At Epping Petty Sessions, on May 24th, Henry George King, wholesale chemist, of 14, Abbott Street, Kingsland Green, was charged with having killed one Eliza Sear, and also with having unlawfully sold and delivered to divers persons quantities of violet powder, containing large proportions of white arsenic and other ingredients, with the intent that it should be applied to the bodies of children of tender years. Mr. Poland opened the case on behalf of the Treasury, and John Nottage and Emma Grout, two grocers, were called to prove the wholesale purchase of violet powder, by them, from the defendant, and several women were called who proved having purchased packets of violet powder from these grocers, and using it to their children, several of whom died in consequence. Mrs. Sear lost two children, one in March, 1877, and another in February, 1878. Her evidence, as to the latter child, was that it was born on the 13th February, and on the day of its birth she sent to Miss Grout's shop for a packet of the powder, which was used, and the infant died on the 18th of the same month. It was a healthy child at birth, but its face turned very red, the skin broke out all over the face and neck, and the more the redness and soreness increased, the more the powder was used, in the belief that it would do good. Soon afterwards the lower parts turned black; this appearance rapidly extended to the body generally, and on the day of its death it gave out from the nose and mouth a "kind of black blood." Its agony was awful, and during the night before its death it screamed continuously.—The inquiry was adjourned till the 31st.

NOTES OF THE MONTH.

The writers in the *Daily News* and *Telegraph* having waxed eloquent over a description of the late slight accident at Messrs. Howard's works, the former authority ascribing it to "camphor pots" and the latter to "ether mills," the *Chemist and Druggist* slyly remarks that "such discoveries should qualify the sub-editors of these 'engines' for admission to the Institute of Chemistry, so evidently original and limited are their notions of every-day chemistry." Surely our friend does not insinuate, for a moment, that the great organic manufacturing chemistry, so highly appreciated in that learned society, leads, in many cases, to equally silly misnomers!

Our contemporary has also investigated the great arsenical violet powder scare, and finds that it is an oilshop-man, and not a chemist and druggist who is guilty; albeit the daily papers describe the manufacturer, who is now being prosecuted, as a wholesale druggist. But whoever may be to blame, will not our friend for once admit that analytical chemists have their use, and sometimes deserve a little less abuse than they get from the trade organs generally, seeing that, by the prompt intervention of the analyst, so dangerous an article has been detected and removed from the market?

A newspaper report, which makes Mr. Jarmain, of Huddersfield, say that ·23 of a grain of metallic copper, per gallon, represents about 1-300th of a grain per half pint, has given occasion for another attack on the part of the press. Perhaps Mr. Jarmain will send us a note stating what he really did say, and so take the sting out of the remarks made about him. The trade journals can, in one column, show the utter inability of ordinary reporters to deal with the most common chemical ideas, and yet they will, in another, eagerly accept as true, without enquiry, a report involving decimals, and on that seek to take away the character, for accuracy in calculation, of an analytical chemist. We should counsel Mr. Jarmain if he has been, as we presume, misreported, to at once demand an apology for the paragraph.

Once more an equality of results, so far as quantities are concerned, but a difference in their interpretation by a public analyst, and by the Somerset House Laboratory respectively. Mr. Allen, of Sheffield, a name well known for excellence in his profession, found a sample of flour which contained an amount of alumina calculating to 18 grains of ammonia-alum per 4 lbs. of flour. The sample having been sent to Somerset House, the chemists there (represented subsequently in the witness-box by Mr. Richard Bannister), found it to contain alumina which calculated to 21·1 grains ammonia-alum per 4 lbs. of flour. Of course, therefore, they confirmed Mr. Allen's certificate, say our readers. But, oh no, they knew better than that, so they went and tried the logwood test, and because it did not work, they found there was no alum. Asked in the witness-box: "Then what is it, Mr. Bannister?" The reply was: "I am sorry I cannot tell you." Here, then, is another secret out (purchased, it is true, at the cost of much annoyance to a worthy man, but Mr. Allen's shoulders are broad enough to bear that), and therefore no analyst must charge any sample with being adulterated by alum, even when he finds a good per centage of alumina, unless the logwood test works.

The only drawback is that one man may use the test on one portion of a sample, while another may try it on the duplicate, and where the first may get a result the second may not. This, however, is just the element of uncertainty which gives the test its value, and enables the second man to say: "I am the true great chemist, and I differ from the humbug who preceded me!" If the Somerset House Chemists would choose only reliable processes, and make them all public together, with the inferences to be drawn from them, their occupation, like Othello's, would be gone, and they would never have the chance of differing from anybody; but their processes and deduction would at once be subjected to public criticism. This, however, they refuse to do, and so analysts must continue to buy their knowledge of the methods and inferences approved by the excise chemists, at the cost of

defeat, without any appeal. We do not know whether there is a "*Baker*" as well as a "*Grocer*," and a "*Chemist and Druggist*" but we believe there is a "*Miller*," so let Mr. Allen stand clear for a visitation of the phials of wrath and logwood.

During the past month there have been four prosecutions in London, for selling oleomargarine or butterine for butter. In three cases the fines were from £10 to £15, and in the fourth 40s. It is, therefore, a much less offence to sell "bosh" in Greenwich, than in Wandsworth and Hammersmith.

When a milkman defrauds the public for years, by adding 30 per cent. of water, and at last gets caught, he suffers the famous 40s.; but let a farmer put in 14 per cent., and get prosecuted by the Dairymen's Association, he gets £10 and costs of counsel, &c. We would heartily endorse the latter decision, but for what reason is the ordinary defrauding milkman to get off with 40s.? Why, because it is only the silly British public, whom nobody cares for, that he swindles, and which has no trade organs to make an outcry when it suffers!

ADULTERATION IN CANADA.

We have received a copy of the Inland Revenue Commissioner's Second Report on the adulteration of food. It appears to be a very exhaustive and complete document, and we observe that of the whole number of samples analysed more than half were adulterated. We shall refer more fully to the report in our next number.

RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
3469	J. L. Pulvermacher	Generating and Applying Electricity	10d.
3617	J. Imray	Bleaching and Cleansing Textile Vegetable Materials	2d.
3643	A. Fryer	Treating the Refuse of Towns	6d.
3742	T. Holliday	Dyeing Textile Fabrics	4d.
3743	J. H. Johnson	Magneto Electric Machines	6d.
3749	J. Schwartz	Manufacture of Sugar	2d.
3752	G. H. Carbutt	Decorticating and Cleaning Rice	6d.
3765	H. E. Newton	Refining Sugar	6d.
3805	J. Holden	Receptacles for Acids and Chemical Fluids	4d.
3817	J. Hammond	Purifying Coal Gas	4d.
3865	J. H. Johnson	Preparation and Treatment of Saccharate of Lime	6d.
3867	F. Wirth	Manufacture of Hydrated Peroxyde of Iron	6d.
4001	H. Meyer	Process of Manufacturing Sugar	6d.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Medical Record; The Miller; The Anti-Adulteration Review; Journal of Applied Science; The Country Brewers' Gazette; Second Report on Food Adulteration in Canada; Report of St. Asaph Rural Sanitary Authority on Water Supplies, by J. Lloyd Roberts, M.B.

The Accident to Mr. W. Baker.—We are happy to be able to state that Mr. Baker is making satisfactory progress towards recovery from the effects of his recent accident, and it is hoped that in a month or so he may be able to return to his business, which, during his enforced absence, is being carried on by one of his late assistants.

THE ANALYST.

JULY, 1878.

SOCIETY OF PUBLIC ANALYSTS.

A General Meeting of this Society was held on Wednesday, the 26th June, the President, Dr. Dupré, F.R.S., in the Chair. The Minutes of the previous Meeting were read and confirmed.

Mr. Hehner and Mr. Young were appointed Scrutineers to examine the voting papers, and reported that Mr. J. W. Montgomery, of Whitehaven, had been elected as a Member, and Mr. E. G. Clayton, assistant to Dr. Bernays, as an Associate.

The following gentlemen were proposed as Members: they will be ballotted for at the next Meeting—Mr. R. McAlley, of Falkirk, Public Analyst for Falkirk and Stirling; Dr. Thomas Woods, of Parsonstown, Public Analyst for King's County; Mr. H. L. Greville, of Finsbury Park; Mr. W. McCowan, F.C.S., Public Analyst for Greenock; Mr. A. Ashby, M.B., F.R.C.S., Public Analyst for Grantham.

The Secretary read a paper by Mr. A. H. Allen "On the Assay of Carbolic Acid Powders."

Mr. W. C. Young read a paper "On the Detection of Alum in Flour."

Dr. Dupré also read a preliminary Note on the same subject.

Mr. Wigner read a "Preliminary Note on the Non-coagulable Nitrogen Compounds Present in the Cereals."

At the suggestion of Mr. Wigner, a vote of sympathy with the widow and family of the late Mr. Baker, of Sheffield, was unanimously passed.

The next Meeting of the Society of Public Analysts will take place at Dublin, during the Meeting of the British Association. The time and place of meeting will be announced next month.

PRELIMINARY NOTE ON THE DETECTION OF ALUM IN FLOUR.

By A. Dupré, Ph.D., F.R.S.

Read before the Society of Public Analysts, on 26th June, 1878.

I have recently been induced again to take up certain experiments on this subject, which press of work obliged me to abandon several years ago, and although these recent experiments are far from complete, I venture to bring them before the Society in the hope of inducing some of our younger members to continue the work in the direction indicated.

There are three constituents in alum which might be made use of for estimating the amount of alum present in a mixture, viz., the potash, or ammonia as the case may be, the sulphuric acid, and the alumina. In the case of alum mixed with flour it will, however, at once be found that these three constituents are not by any means equally available for our purpose. Thus the amount of potash naturally present in wheat flour is so great as to entirely mask the small additional quantity contained in the alum which could reasonably be added to the flour. The potash, therefore, is, in this case, entirely

unavailable. The case, is, I am sorry to say, almost equally strong against the ammonia. I have made a number of experiments in which I endeavoured to separate the ammonia by distillation with various alkalies, carbonate of soda, lime, and magnesia, but in every case the proportion of ammonia obtained from, apparently, pure flour was so great that it masked the small additional quantity added in the alum. I next tried to separate the ammonia at lower temperatures, but with equally unsatisfactory results. Finally I simply extracted the flour with pure cold distilled water, filtered, and estimated the ammonia in the filtrate directly by Nessler's test (previously precipitating by pure caustic potash), but again found that the ammonia naturally present masked that added. The estimation of the sulphuric acid seems somewhat more promising, but here the difficulty in getting it into a solution available for quantitative estimation is so great that I have not as yet obtained any very satisfactory data. The cold aqueous solution of a flour is, in the first place, exceedingly difficult to obtain clear by filtration, and when obtained clear it becomes turbid again on standing, and almost refuses filtration, and every reagent added to it causes a precipitate. When this is again got rid of the turbidity reappears on standing, and as we cannot evaporate and ignite, owing to the danger of either forming sulphuric acid from sulphur compounds present, or of destroying it, the estimation of the sulphuric acid actually contained as such in the aqueous extract is thus at once tedious and very unsatisfactory. I have endeavoured to overcome this difficulty by dialysis, but with little or no result, as the organic matter causing the difficulty passes through the dialyser. Extracting the flour with various liquids other than water also led to no result. Nevertheless, I believe if a satisfactory method for the estimation of the sulphuric acid which can be obtained from a flour without incineration can be found, it will furnish a very valuable guide in judging of the freedom from alum, or otherwise, of any sample of wheat flour, and I hope some of our members may be induced to take this subject up.

We are thus, at present, reduced to the last constituent mentioned above, namely, the alumina, as a means for estimating the amount of alum which may have been added to a given sample of flour. Fortunately the alumina can not only be estimated with ease and exactness, but there can be no doubt that in really pure wheat flour the amount of alumina naturally present is but an insignificant quantity. There is, however, at least one compound of alumina which, when present in moderate proportion, cannot be looked upon as an adulteration, namely, the soil which may adhere to the grain and thus get mixed with the flour. It is sometimes affirmed that inasmuch as millstones are not only frequently repaired with a cement containing alum, but are also soaked in a solution of alum, small quantities of alum found in a flour might be derived from these sources. It can, of course, not be denied that minute traces of alum would thus get into the flour, but to suppose that any appreciable proportion could thus be introduced would seem to me utterly absurd. Thus 12·5 grains of alum in four pound of flour are equal to one pound per ton, and how often would a stone require repairing or soaking to give such a proportion of alum. This cause, as a possible explanation of the presence of alum may, I think, be safely dismissed, and we must return to the consideration of soil. For our purpose we may look upon soil as a silicate of alumina and iron in somewhat varying proportions, but always with a great preponderance of silica. Fortunately pure flour contains but a very small proportion of silica, and any, even slight, increase beyond this *normal proportion* would easily become apparent. It will however, no doubt, require a

considerable number of analyses to be made before we can fix the proportion between silica and alumina which will fairly represent the soil adhering to the grain.

When this is done we shall be able to estimate the possible amount of soil which could have been present, from the amount of silica found, with sufficient exactitude for practical purposes. I am now engaged in the analyses of a number of samples of flour with this object in view, and hope other Public Analysts will work in the same direction. In every sample we must thus estimate the silica, the alumina, and as oxide of iron is also a constant constituent of soils usually to the same extent as alumina, the oxide of iron also. When adopting the plan described by myself some years since for the estimation of alumina in bread, all these can readily be estimated in one analysis, almost without any additional trouble.

Finally, I have made some attempts, not without success, to separate the alum as such, and here I also hope that others will take up and continue the experiments. 100 grms. of flour are well shaken up with chloroform in a stoppered bottle (best with a funnel shaped bottom and a tap like a separating funnel) and allowed to stand at rest for 24 hours. At the end of that time all the flour floats at the surface of the chloroform, while a small amount of deposit will be found at the bottom containing the mineral impurities, and among them the alum. In the few experiments I have made, I had no difficulty in thus detecting an appreciable amount of alum in this deposit, when using a flour which I had carefully mixed with 15 grains of finely ground ammonia alum to the 4-lb. Should the same result be obtained by others, this method will, I believe, be the most satisfactory hitherto proposed for demonstrating the presence of alum in a flour, even to those who are not chemists. The chloroform I made use of, ordinary methylated, dissolved practically no ammonia alum.

Since the reading of this note I have been informed by Mr. O. Hehner that chloroform had previously been proposed for separating mineral impurities from flour (though not with a view to the detection of alum), but I have not been able as yet to obtain the original paper containing the proposal.

NOTE ON THE ASSAY OF CARBOLIC ACID POWDERS.

By Alfred H. Allen.

Read before the Society of Public Analysts, on the 26th June, 1878.

My attention has been recently directed to the composition and strength of Carbolic Acid Powders, and as the assay of such materials is occasionally needed, it may save other chemists some trouble if I place my own observations on record.

There is a common, but mistaken idea* that carbolic acid powders are usually made by adding a certain proportion of crude carbolic acid to lime. This is an error, at least so far as the better known products are concerned. Thus, the basis of Calvert's Carbolic Powder is siliceous matter obtained as a residue from the manufacture of sulphate of Alumina, and several other makers employ a similar article.

The following analysis show the composition of the residue left on igniting

* The new *Chemistry applied to the Arts and Manufactures*, edited by C. Vincent, erroneously described these powders. Vol. 1, p. 612.

carbolic acid powders. A, is the residue from a canister of Calvert's powder; B, the residue from a powder prepared by another manufacturer:—

	A.	B.
Silica	67·4 per cent.	68·6 per cent.
Alumina	28·0 "	26.3 "
Oxide of Iron	traces.	traces. "
Lime	·8 "	1.3 "
Undetermined matter	3·8 "	3.8 "
	100·0	100·0

MacDougall's Disinfecting Powder is made by adding crude carbolic acid to the impure calcium sulphite, obtained by passing sulphurous acid gas over previously ignited limestone. The following analysis shows the composition of a sample of MacDougall's powder, after extraction of the carbolic acid by ether:—The extraction of the carbolic acid was probably incomplete as the analysis subsequently made shews free lime, and the powder was distinctly alkaline.

Silica	2·4 per cent.
Alumina...	3·4 "
Oxide of Iron	traces.
Lime	46·5 "
Magnesia	·3 "
Sulphurous Acid (SO_2)	7·5 "
Sulphuric Acid (SO_3)	29·2 "
Carbonic acid water and undetermined matter	10·7 "
	100·0 "

As the carbolic acid in the siliceous products is wholly in a free state it is readily extracted by ether, or other solvents. It is, however, difficult to drive off the solvent liquid afterwards without loss of some of the carbolic acid itself by volatilization. Thus a sample examined by this process gave about three per cent. less than the real amount of carbolic acid present. It is also inconvenient to apply the solution process to a sufficiently large amount of the sample to allow of an examination of the quality of the crude carbolic acid extracted. Processes for the determination of carbolic acid by conversion into tribromo-phenol or sulphocarbolic acid are unsuited for the assay of carbolic powders, as they ignore the presence of tar-oils, and give inaccurate results where applied, without correction, to mixtures containing cresylic acid.

On these accounts a more convenient process is that based on the distillation of the powder and collection of the carbolic acid, &c., volatilized. Such a process is thus described in the *Manufacturing Chemistry*, edited by Vincent (Vol. I. page 613), being apparently derived from a circular issued by the manufacturers of Calvert's Carbolic Acid Powder.

"Weigh 1,000 grains of the powder and place it in a small tubulated retort. Heat the retort gradually until the liquid distilled over ceases to drop (a brisk heat is required towards the end of the operation.)"

I find it desirable to agitate the contents of the retort once or twice towards the end of the process, as the powder is a very bad conductor. It is well to expose every portion of the powder in turn to an incipient red heat. I have tried passing a slow current of coal-gas through the retort throughout the operation, but the advantage is not worth the complication.

The carbolic acid vapour readily condenses, and is collected in or transferred to a graduated tube for measurement. The carbolic acid is covered by an aqueous layer from *which its separation* is facilitated by immersing the tube in warm water. From the

volume of the crude carbolic acid obtained, the per centage contained in the powder can at once be ascertained. Of course the weight of the liquid in grammes is about 1-20th greater than its measure in cubic centimetres, owing to its being slightly heavier than water.

Good Carbolic Powder should contain 12 or 15 per cent. of crude carbolic acid, and much that is sold does not assay half the above amount.

As an illustration of the accuracy of the process I may quote the following experiments :—

85 grammes of the siliceous residue obtained by igniting Calvert's Powder were intimately mixed with 15 c.c. of commercial liquid carbolic acid, the product placed in a retort and distilled. The distillate, exclusive of the aqueous layer, measured 14·2 c.c. Another experiment performed in exactly the same way, also gave 14·2 c.c. of carbolic acid. Hence the process errs on the side of deficiency by about 0·8 per cent., in a powder containing 15 per cent. This correction might be advantageously applied when accurate results are desired.

The distillation process is applicable to MacDougall's Disinfecting Powder, though the results are probably below the truth.

When applied to a powder made by adding carbolic acid to slaked lime the distillation process fails. Two experiments were made on mixtures of 45 grammes of slaked lime, and 8 c.c. of liquid carbolic acid. The process was continued for six hours, and the contents of the retort were very strongly heated. The distillation proceeded rapidly at first, but very slowly during the rest of the operation. In each case the oily portion of the distillate measured barely 5 c.c. In a similar experiment in which 15 c.c. of carbolic acid were used less than 10 were recovered. In another case in which 25 grammes of slaked lime and 5 c.c. of fused crystals of carbolic acid were distilled, only 3·3 c.c. were recovered. This experiment also showed that the distillate was no longer pure carbolic acid, being incompletely soluble in two volumes of 9 per cent. soda solution, and containing distinct traces of a body soluble in petroleum spirit. It is a curious fact that in the above experiments made by distilling carbolic acid with a large excess of slaked lime, the loss was constantly equal to about one-third of the carbolic acid taken, no matter how much that was. The fact is interesting and seems to indicate the occurrence of a definite reaction,* which is the more strange, as previous observers have found that when carbolic acid is distilled with *quick*-lime, it passes over *unchanged.*

From these experiments it is evident that the distillation process is unsuited for the assay of carbolic acid powders made with lime. Such powders are of very little value for disinfecting purposes.

The "carbolic acid" used in the preparation of disinfecting powders is frequently largely adulterated. In addition to consisting in chief part of cresylic acid,† it is often mixed with a large percentage, and occasionally almost wholly consists, of worthless tar-oils. The plan usually adopted for the detection and separation of these impurities is based on their insolubility in caustic alkalies, and I have no better method to suggest, but the following hints are worth notice as the results of some careful experiments.

Cresylic acid is much less soluble than carbolic acid in weak alkaline liquids, and on

* I propose to examine the reaction more minutely at a future time.

† I think it convenient to speak of these bodies as carbolic and cresylic acids, though I am fully aware of the objections to these names.

addition of a large excess of the solvent is partially deposited. Hence its presence in carbolic acid may be detected, and the proportion perhaps approximately estimated by careful addition of weak solution of caustic soda, and comparison with standard samples of known composition. But one volume of carbolic or cresylic acid, or of any mixture of the two, is completely soluble at 15° C. in two volumes of a solution of pure caustic soda (free from alumina) containing 9 per cent. of NaHO. If weaker alkali be used, cresylic acid is liable to be left undissolved. Hence, if a sample of crude carbolic acid, such as is obtained by distillation of a disinfecting powder, be shaken in a graduated tube with twice its volume of soda solution of the above strength, all the carbolic and cresylic acids will be dissolved, while the worthless tar-oils will remain insoluble, and on standing will form an oily layer above or below the alkaline liquid according as the adulterant consists of light or heavy oil of tar.

This is the ordinary process of assaying the distillate from disenfecting powders, except that I recommend rather stronger alkali than is generally employed.

Hager describes the following modification. 5 c.c. of the sample are to be treated with 3 c.c. of a mixture (of equal volumes?) of rectified spirit and caustic potash solution containing 33 per cent. of K H O, and the whole shaken. Five c.c. of petroleum spirit are then added, and the mixture again well agitated. The amount of real carbolic acid in the sample is found by subtracting 3 c.c. (the volume of alcohol and alkali solution added) from the volume of the lower layer. I have carefully tried this process on purposely prepared mixtures of carbolic acid and tar-oil, and find that the proportion of carbolic acid is seriously over-estimated, probably on account of the alcohol employed. On the other hand, the use of petroleum spirit is a decided advantage, as it dissolves the tar-oil readily and greatly facilitates its separation from the alkaline liquid. Hence, after treating the sample in the manner previously described with two volumes of soda solution containing 9 per cent. NaHO, and noticing whether the oily layer floats or sinks, I add a volume of petroleum spirit equal to that of the sample under examination, and again shake. The oil is dissolved off the sides of the tube and forms with the petroleum spirit an upper layer, which separates quickly, and the volume of which can be read off with accuracy. Experiments on mixtures of known composition have given me by this modification very good results.

A useful comparative test of carbolic acid powders may be made in the following manner:—

Mix 25 grains of each powder with one ounce of flour, and then add gradually to each mixture 10 ounces of water. Mix well in the cold, then raise the liquids to the boiling point, and pour out each paste into a glass to set. Leave the pastes freely exposed to the air and the value of the powders as antiseptics will be indicated by the time which elapses before mildewing occurs, and the rate and manner in which it progresses.

PRELIMINARY NOTE ON THE NON-COAGULABLE NITROGEN COMPOUNDS PRESENT IN THE CEREALS.

By G. W. Wigner, F.C.S.

Read before the Society of Public Analysts at Burlington House on 26th June, 1878.

It has been pointed out by Church and others that the estimation of nitrogen for the *purpose of calculating* the albuminous matter present in vegetable products, is not

perfectly reliable as a true measure of the flesh formers or albuminous matters properly so-called.

All the cereals, as well as roots, contain a considerable proportion of nitrogen combined in other forms which are not capable of being coagulated by acid, and which, judging from inference, have very little flesh forming property. This non-coagulable nitrogenous matter exists mainly in the husks or bran of the cereals—the flour, when perfectly freed from husk, containing a comparatively small proportion of it. It is evident, therefore, that this may have led to some erroneous estimates of the relative feeding value of the whole meal, as compared with flour. It is quite clear that as regards whole meal, the nitrogen determination is not to be relied upon as giving an accurate estimate of the amount of flesh formers present.

I cannot at present specify the limits within which this determination may be trusted, although I have already made some 150 nitrogen determinations with this object, but the examinations already completed enable me to point out some facts of interest. Thus, I have taken some fifteen representative samples each, of Wheat, Barley, and Oats. These samples have been ground, and the nitrogen in the whole meal determined in the ordinary way by the soda lime process. Another portion of the whole meal has been treated with a solution of carbolic acid, faintly acidulated with say two or three drops of dilute nitric acid, and after warming, standing, and filtering, the insoluble residue has been washed on the filter with carbolic acid solution. Since the true albuminoids are coagulated by this process, the residue on the filter will contain them all, while the nitrogenous matters which are present in other forms, whether as nitrogen salts or alkaloids, will pass through with the filtrate.

In order to determine the true albuminoids, the residues left on the filter after this process have been dried and detached from the filter, and the filter itself carefully cut up into small fragments and mixed with the residue, and the whole burnt in the ordinary way in the combustion tube.

Treated by this process, I find that the average of the fifteen wheats show that 17·7 per cent. of the total nitrogen is present in such a form that it is not capable of being coagulated by carbolic acid—that 17·6 of the total nitrogen present in the oats is also in the same form, and that 14·7 per cent. of the total nitrogen present in the barleys is in the same form.

These, however, are only averages—there is considerable variation among the samples themselves. I find, for instance, in one sample of wheat that the proportion of nitrogen present as true albuminoids as distinct from that present in a non-coagulable form was 95 per cent. of the total, this being the maximum percentage which I have at present found. While the minimum proportion yet met with was 74 per cent. The maximum proportion which I have yet found in oats was nearly 93 per cent., and the minimum proportion 57 per cent. The maximum proportion which I have found in barley was nearly 95 per cent., and the minimum about 70 per cent. The sample of oats which showed the very low figure of 57 per cent., was one of the worst samples of its class which I ever saw—it consisted almost entirely of empty husks.

Assuming then, as I think I may fairly, that these samples were really representative ones, I conclude that the flesh formers present in the whole meal of the cereals have been over estimated to the extent of from 15 to 20 per cent., and that the residual nitrogen present in other forms is not equally valuable as a flesh forming constituent.

It becomes now of great importance to find in what state of combination this residual nitrogen does exist. There is, no doubt, that some of it is present as nitrates and nitrites; but at present I have not sufficient data to enable me to give the whole of the averages. I have obtained figures to show that the nitrogen in these two forms is part only of the residual quantity. Thus, for instance, in the case of barley, the largest proportion of nitrogen—in the form of nitrates and nitrites, as determined by the aluminium process which I have yet found—is ·050 per cent. equal to ·194 per cent. of nitric acid, and the lowest proportion yet obtained is ·033, equal to 1·62 per cent. of nitric acid. In the first case the non-coagulated nitrogen was ·140 per cent., and the proportion of it present as nitrates and nitrites was therefore 36 per cent. In the second case the non-coagulated nitrogen was ·061 per cent., and the proportion of it present as nitrates and nitrites was 54 per cent.

In the wheat samples, as far as I have already finished them, I have found as a maximum ·051 per cent. of nitrogen as nitrates and nitrites, and as a minimum ·032 per cent. in the same forms. The samples contain respectively ·101 per cent. and ·120 per cent. of non-coagulable nitrogen. In these cases, therefore, the nitrogen present as nitrates and nitrites corresponds to 50 per cent. and 27 per cent. of the latter quantities.

In the case of another sample of wheat with contained ·300 per cent. of nitrogen in non-coagulable forms, the nitrogen as nitrates and nitrites only amounted to ·035 per cent., or less than 12 per cent. of that which is at present unaccounted for.

I am completing the examination of these samples in order to determine, not merely the average proportion of nitrates and nitrites, but also the form in which the other combined nitrogen is present.

ADULTERATION IN CANADA.

We have received from Mr. Girdwood, of Montreal, the official report of the Department of Inland Revenue for Canada, on the adulteration of food during the first part of the year 1877.

This report is in so many points instructive, not only as showing the extent to which adulteration prevails in Canada, but also as showing the methods of analysis which are adopted by the public analysts there, that we notice it at rather more length than usual.

It is one of the most exhaustive reports in its character that we ever recollect to have seen. It is quite evident that the authorities who are charged with the execution of the Adulteration Act in Canada are not disposed to allow the work which has been done by the analysts to be almost ignored—as is unfortunately the case in this country. It contains not only a general summary bearing the signature of Mr. A. Brunel, the Commissioner of Inland Revenue, but in addition verbatim copies of the reports of the analysts for each division, and tabulated statements of the results of every analysis, which, strange to say, are presented in tabular form, giving the percentage of each constituent, and also some 25 pages of carefully engraved copies of photographs received from our own Inland Revenue Authorities of articles used as adulterants of food and tobacco and of some of the genuine articles themselves. In its general character and the mode in which it has been compiled, the blue book is highly creditable to the department.

The first general feature observable is that the Canadian Government at any rate do not consider that the Adulteration Act is quite as limited in its character as the interpreters of our own Act in this country would seek to prove, inasmuch as Paris green, which is largely used for the purpose of destroying the Colorado beetle, forms a very large proportion of the number of samples examined, 50 out of the total of 488 being of this substance.

The report comprises separate statements from four different analysts, appointed for the districts of Toronto, Montreal, Quebec, and Halifax, and a list of the samples submitted by the 11 inspectors. We are not aware that any statement has hitherto been published of the names, &c., of the Canadian public analysts; we find that for the Toronto division the analyst is W. Hodgson Ellis; for the Montreal division, J. Baker Edwards, Ph.D. D.C.L. F.C.S.; for the Quebec division, F. A. H. La Rue, M.A. M.D.; and for the Halifax division, Robt. G. Fraser. The total number of samples submitted to these four analysts during the period embraced by the report was 488, of which 247, or a fraction over 50 per cent., were found to be adulterated. 50 of these samples were, as before mentioned, Paris green, and the other samples appear to have comprised a tolerably fair mixture of goods and condiments of all kinds, but if anything there is a leaning towards condiments rather than to articles which possess actual nutritive value. With this exception there is no fault to find with the selection. Thus far then the general result of the examination is somewhat akin to that which was found in England some 5 or 6 years ago, viz., that half the articles of food and drink sold were adulterated.

The general conclusions at which Mr. A. Brunel arrives are that a large proportion of the condiments submitted are adulterated, and to a very considerable extent, that coffee appears to be very lergely adulterated, that nearly half the samples of butter were adulterated, and that the milk continues to be largely adulterated, while he adds that the experience now acquired in connection with the adulteration of this most important article of food is sufficient to justify the issue of specified instructions as to what should be considered as an adulteration within the meaning of the Act.

The representative of the Canadian Inland Revenue Department, acting we presume on behalf of the Department, has therefore adopted the principle which the Society of Public Analysts have been urging for the last three years, viz., that definite standards should be laid down and acted upon. In connection with this point it is of great importance to note that the standard for the analysis of milk, which has been adopted by the analysts in Canada and recognized in this Blue Book, is that fixed by the Society of Public Analysts; and that there are only one or two cases tabulated in which a milk, showing less than 9 per cent. of solids not fat, has not been returned as adulterated, and even when this has been the case, some explanation, such as the presence of an excessive proportion of fat is found in the report of the analyst. It may be fairly be assumed, therefore, that the Canadian analysts eventually found—as our own leading analysts did—that 9 per cent. of solids not fat, may fairly be taken as a percentage, which, while it does not fully protect the public, at any rate inflicts no injustice upon the vendors of milk.

The photographs of the adulterants, and some of the starches, presented to Canada by the English Indland Revenue Department, have been reproduced apparently by lithography and with considerable care and accuracy.

We pass now to the consideration of the individual reports of the analysts,

Mr. Ellis, of Toronto, appears to have examined twelve samples of tea, but unfortunately in no case were the alkaline and earthy salts present in the ash estimated. Some pains, however, were apparently taken to determine the estimation of theine present, which was found to vary from ·38 to 2·31 per cent. The estimations would be of greater value if the report had stated by what process their theine was determined. Three of the samples were faced, but no other adulteration was detected. In reference to coffee, adulteration with roasted wheat, peas, and beans is reported in addition to the usual adulteration with chicory. Six sample of sugar were examined, four of which were of English make or refining, and from the figures of the analyses it is evident that they were all of extremely low quality, but no adulteration was detected. Three out of four samples of pepper were adulterated with wheat flour, while samples of cloves, allspice, and ginger were all found to contain wheat flour, Indian corn meal, or cayenne pepper. Canned and tinned fruit and vegetables were generally reported to be of good quality with the exception of Lima beans and French peas, both of which contained minute traces of copper. Out of eleven samples of milk, four were watered, five were deficient of cream, and only two were genuine. Twelve samples of butter were examined, but unfortunately the examination only went as far as the old process of determining the proportions of water, salt, and curds, no investigation as to the proportion of fatty acids was made. It may be of value, however, in some case in this country, to point out that the maximum percentage of water found was only 10·5 per cent., and the maximum percentage of salt 5·9 per cent. The minimum proportion of butter fat in a sample marked Salt Butter was 80·80 per cent. A considerable number of the samples of Paris Green, which, of course, ought to consist entirely of arseniate of copper, were adulterated with sulphate of baryta, the proportion sometimes reaching to 21 per cent.

Dr. Edwards, of Montreal, reports having examined eighty-five samples, of which fifty-eight were adulterated; he has, of course, met with the usual adulteration of skim milk, and states that the majority were so sophisticated. As to spices, he says that the husks of corn and various grains are freely mixed with them, together with such kinds of farina flour or ground rice as may best suit the texture or general appearance of the spice. At Montreal, according to Dr. Edwards, perfectly pure fresh butter is but seldom met with in the market; butterine appears to be largely sold, but not under its true name. One case of tinned vegetables had been coloured by copper. When referring to the samples of Paris Green submitted to him, he says that six out of twelve were more or less adulterated, and he draws special attention, and we think very wisely, to the dangerous results likely to occur to the water of streams used for drinking purposes by the continued application of arsenical dressings to fields which drain into them. He concludes by pointing out that sulphur and phosphorous carefully applied, might be more beneficial to the soil, and might be less injurious to the character of the water in the watercourses, while equally fatal to the insects it was sought to destroy.

Dr. La Rue, of Quebec, reports the analysis of twelve samples of butter, all of which were in his opinion pure, but unfortunately no determinations appear to have been made of the fatty acids or of the specific gravity; the melting point was determined, and it is stated that fusion commenced between 20° and 21° C., and was completed at 30° and 31° C. It is evident that these determinations of melting point have not been made with accuracy enough to enable them to be of any value for comparison with kindred

English butters. The only adulterated samples met with in this district, were five samples of Paris Green, adulterated with sulphate of baryta.

Mr. R. G. Fraser, the analyst for the Halifax division, reports the analysis of 72 samples, and says that the ground coffees were all mixed with peas or chicory in larger or smaller proportions, excepting one sample which was pure. Of six samples of pepper three were pure and three were adulterated with the husks of mustard seed and bread, the proportion of adulteration reaching in one case to 90 per cent. Perhaps the most interesting feature in Mr. Fraser's report is that having examined eight samples of milk he found that all were pure, a statement he was perfectly justified in making, for the average of the solids not fat amounted to 10·85 per cent., a pretty conclusive proof that the Canadian analysts have not erred on the side of injustice to the vendors in adopting the standard of 9 per cent. fixed by the Society of Public Analysts in this country.

A few samples were analysed of preparations of articles which appear to be included under the title of condiments, and we certainly think they deserve this title rather than that of drugs. One sample, called Campbell's quinine wine, was found to consist of sherry wine, tincture of orange peel, citric acid, sugar, and sulphate of quinine, the proportion of the latter being half a grain per fluid ounce, and the strength 64 under proof. Another sample, marked Lyman's quinine wine, contained only one third of a grain of sulphate of quinine per fluid ounce, and the alcoholic strength was 75 under proof, while the last sample mentioned in the list, and called Lewis's quinine port wine, is reported on as follows: "Consisting of inferior red wine (coloured with logwood), citric acid, sugar, tincture of gentian and orange, and traces of strychnia and brucia, and a small quantity of tincture of nux vomica," and it contained one third of a grain of sulphate of quinine per ounce, and the alcoholic strength was 68 under proof.

The tabulated statements at the end of the report are presented in a very valuable form, and we find there that some of the analyses have been carried to a much further extent than appears from the statements already commented upon. Thus we find that out of 49 samples of butter 10 were adulterated with foreign fats, the maximum proportion being 61 per cent. All these sample are in Dr. Edward's district, and we may fairly presume that if the fatty acid process had been applied to the samples in the other districts the result would have been almost identical.

Mr. Ellis found one sample of cocoa coloured with venetian red, and two samples of coffee containing roasted wheat in addition to peas and chicory. Mr. Ellis also had three samples of sugar, all obtained from the same vendor, and containing common salt in proportions varying from a mere trace to 10 per cent. From the fact that the one containing the largest proportion was taken from the top of a hogshead, and the one containing the smallest proportion from the bottom of the same hogshead, it seems tolerably clear that it was merely a sample of sugar which had been wetted with sea water in transit.

From what we have written it will be seen that although we cannot congratulate Canada on having attained as great a degree of general purity with regard to articles of food and drink as has been attained by the mother country, yet the Act so far has worked well and apparently done good service. If our own Government would follow the example set by the younger one, and publish in a blue book the names of the vendors of all those articles which were found to be adulterated, we should soon find that our percentage of adulteration would drop even lower than it has done.

OBITUARY.

Mr. William Baker.

When in our May number we referred to the terrible accident which had happened to this gentleman by which his scull was fractured, we stated that although he was in a very critical condition there was a ray of hope of his recovery, but the hope was in vain, for an abscess formed at the seat of the fracture, and after undergoing an operation for its removal, Mr. Baker became worse, and we regret to state died on the 6th June.

Mr. Baker was 48 years of age. The son of a gunmaker in London, he studied at the Royal School of Mines under Dr. Percy, with whom he ever since maintained the closest terms of intimacy and friendship. He also studied chemistry under Dr. Lyon Playfair, M.P. In 1854 he came to Sheffield, entering into the service of Messrs. Rawson, Barker and Co., Royd's Mill, as their analytical chemist and manager, and remained there fifteen or sixteen years. He then entered into practice on his own account as an analytical chemist. Soon afterwards he was appointed analytical chemist for the Upper Strafforth and Tickhill division, which appointment he held until recently; he was also the analyst for the boroughs of Rotherham and Barnsley. His work as an analytical chemist included an investigation into the vexed question of the presence of nitrogen in steel, which investigation he undertook in conjunction with Mr. Graham Stuart. More recently he carried out a series of very elaborate experiments with the view of endeavouring to remove phosphorous from iron and steel by the action of chlorine and other gases. An enthusiast in his profession, he was the author of several patents on matters more or less connected with chemistry, some of which are said to be of no small value. He was the first to notice the fact that what is known as the Pattinson process of purifying lead from silver also effected the removal of copper and other foreign substances; and by the application of this principle he succeeded in gradually increasing the quality and value of the red and white lead manufactured by Messrs. Rawson & Co. During the fifteen years he was with that firm he devoted special attention to lead, and many of the results of his observations and experiments are recorded in "Percy's Metallurgy." He was the lecturer on toxicology at the Sheffield School of Medicine; and at the Collegiate School, where he was immensely popular with the boys, he was, until very recently the chemical lecturer.

Mr. Baker was married, and leaves a widow and a son. The latter had but just entered his father's laboratory as a student. At the meeting of the Society of Public Analysts on the 26th June, a resolution of sympathy with Mrs. Baker, under these distressing circumstances, was unanimously passed and ordered to be forwarded to her.

SNUFF ADULTERATION.

The following general order has just been issued by the Board of Inland Revenue with reference to snuff, which will be studied not only by snufftakers, but by others; it raises the question as to what can be legally called adulteration, and that which is legal adulteration :—

"It is ordered that notice be taken of the recent change in the law relative to the manufacture of snuff, and that a copy of this order be given to every tobacco manufacturer and snuff miller. With a view *to prevent the use of chromates* and other salts of a poisonous quality the Act 41 and 42 Vict., cap. 15,

provides that on and after the 1st October next no salts or alkaline salts, except the carbonates, chlorides, and sulphates of potassium or sodium, and the carbonate of ammonium, shall be used in the manufacture of snuff, and if after the said day any snuff is found in the possession of or is sold by any manufacturer, dealer, or retailer, which after being dried at a temperature of 212° Fahrenheit is found to contain more than 26 per cent. of such salts, and inclusive of those naturally in the tobacco, such snuff is liable to forfeiture, and the trader incurs a penalty of £50. The attention of officers and of manufacturers is also called to the Act 30 and 31 Vict. cap. 90, by which the quantity of lime which may be added to snuff in the process of manufacture is limited to 1 per cent., and which further enacts that if any snuff in the possession of a manufacturer or dealer, after such snuff is dried at a temperature of 212° Fahrenheit, is found to contain more than 13 per cent. of lime or magnesia, or both, it is liable to forfeiture, and a penalty is incurred by the trader. The Board also desires to inform those manufacturers who require to use tonquin beans in scenting certain kinds of snuffs, that the proportion of beans which they may use for that purpose is strictly limited to 3 per cent., and that any snuff kept or sold by any manufacturer or dealer found to contain beans in excess of this proportion will be seized as forfeited. The trader will also be liable to a penalty."

ANALYSTS' REPORTS.

Dr. Albert J. Bernays, the Analyst for the Parish of Camberwell, has issued his quarterly report, in which he deals largely with the adulteration of beer, samples having been obtained from all the best breweries in the country, and he would now, as the result, be able to ascertain at once whether the article delivered was in an unadulterated state. He had also examined two brandies, one gin, and one whisky, and found they were of the proper alcoholic strength. Of home-made wines he had had submitted to him a sample of elder, black currant, two of orange, and two of ginger, upon which he made no further remark than that the quantity of sugar, especially in the orange and ginger wines, not only rendered them acescent, but tended to disguise their alcoholic contents so as to make them appear weak. Of five breads and six butters he had nothing to report but that they were within the standard of Somerset House. Twenty milks had been analysed, six of them in duplicate on account of their suspicious character, but he had only furnished two certificates for prosecution. No. 202 contained 28 per cent., and 205 9 per cent. of added water. Another sample furnished a curious example of the ignorant manner in which milk was dispensed, for it contained 65 per cent. of cream, and 22 per cent. of solids. He had examined four specimens of confectionery, two of them illustrating some of the difficulties of the analyst, as the samples were mixed; one variety contained smalt or blue glass, but he had only one specimen. A very good sample of pickles concluded the articles, fifty-six in number, which he had analysed during the quarter, and on the whole undoubted progress had been made in the quality of all submitted.

Dr. Muter, the Analyst for Lambeth, presents for that important parish a highly satisfactory report, as sixty-nine articles of common consumption had been analysed during the quarter, but none of them were adulterated. The samples submitted for analysis included bread, butter, sugar, tea, coffee, pepper, mustard, &c.

In Bermondsey, Dr. Muter presents a similar result, with the exception of beer and milk, in which articles adulteration was found. At the Vestry meeting, Mr. Churchwarden Sheppard, in alluding to the flattering result to the tradesmen of the parish, said it was only fair that the ratepayers should know the honest shopkeepers as well as the dishonest, and he therefore moved that when the certificate was received from the analyst, the names of tradesmen from whom the samples were obtained should be read at the vestry meetings. Mr. J. A. Smith seconded the motion, and it was agreed to.

In Newington, the Vestry have not put the Adulteration Act in force, but their attention being drawn to its provisions by the Local Government Board, they have resolved to instruct the Sanitary Committee to employ a police-constable to obtain samples from the different tradesmen. This is the only parish which has employed the police to enforce the Act.

At Newport (Mon.) Town Council meeting the borough analyst's reports was presented. It showed that the inspector, Mr. E. H. Jones, had collected four samples of tea, four of mustard, four of pepper, and four of butter. Of these sixteen samples, fifteen were genuine, and one adulterated, viz., mustard, which was mixed with wheat flour and turmeric. The Mayor (Mr. Moses) and several Members of the Council said it was a highly satisfactory report.—*Grocer.*

Dr. Barclay, the Public Analyst for Chelsea, has just presented his quarterly report to the Vestry of that parish, in which he states that he has analysed a large quantity of articles, including coffee, mustard, pepper, jams, spirits, butter, lard, &c., the great majority of which he found to be pure. Butter in two cases, however, was found to contain 50 per cent. of foreign fat, and in one case the seller was successfully prosecuted. One sample of lime-juice cordial was simply lime-juice sweetened and diluted with water.

It contained no spirit, and less than one-fifth of citric acid, which occurred in lime-juice of average quality. Mr. Wheelhouse said it was most important that the attention of the analyst should be called to the quality of some of the jams sold to the poor. He was given to understand that large quantities of rotten figs were expressly imported to be used in the manufacture of "family jam." Would it not be well if their analyst looked after this article. Dr. Barclay promised that the inspector should have the necessary instructions in the matter. In reply to further questions, he stated that a large number of samples of beer and spirits had been analysed, and in no case had he found adulteration excepting occasionally the addition of a little water, and he did not think on that ground it was advisable to prosecute. The report was received.

At the Somerset Quarter Session, the County Analyst, Mr. Stoddart, reported that he had made during the quarter 273 analyses of food and drinks, 270 of which had been submitted by the police authorities and three by the public. Forty-one samples were found to be adulterated, and amongst these was one of "fictitious claret," which was evidently a most unwholesome beverage.

Dr. J. F. Hodges, analyst for the County of Antrim, in his report to the grand jury, states that he analysed during the quarter ending, March last, 91 samples, of which 34 were adulterated. The articles examined comprised 35 samples of sweet milk, 23 of butter milk, 9 of bread, 6 of oatmeal, 4 of tea, 5 of water, and 1 each of rice, lime juice, sugar, room paper, and flour.

LAW REPORTS.

Conviction of Farmers for Adulterating Milk.—Thomas Rose, a farmer, residing at Binfield, Berks, was summoned before Mr. Partridge by the Metropolitan Dairymen's Society for selling to Mr. John Jones, the Manager of the Surrey Farm Dairies, Renfrew Road, Kennington Lane, milk adulterated with 20 per cent. of water. Mr. Ricketts prosecuted on behalf of the Society, and said that the complainant carried on an extensive business at Kennington and Lambeth, and contracted with defendant for a regular supply of pure milk. For some time past the customers complained of the quality, and the consequence was that three churns were carefully watched, and found to be adulterated. He called Jones, who said he was the manager of the Surrey Farm Dairies in the Renfrew Road, Kennington Lane. He produced the contract with defendant for the supply of pure milk, to be delivered free at Waterloo terminus. In consequence of complaints he caused samples to be taken on the 20th of last month. William Hands, a guard in the Company's employ, proved the reception and delivery of three churns of milk at Waterloo terminus. They were locked up, and defendant was sent for. When he arrived the samples were taken. Alfred Parish, the inspector of the Association, said that on the morning of the 20th ultimo he saw the three churns locked up at the Waterloo terminus. They were opened, and samples taken from them. He offered the defendant some of them, and asked him to accompany him to Dr. Muter's, the analyst. He refused to go, and witness accordingly delivered the samples to Dr. Muter, and left them. He now produced certificates from the latter, showing that the milk was adulterated to the extent of 20 per cent. with water. Mr. Jones was recalled by Mr. Partridge, and said that one of their customers was fined at this court a few months ago, and complaints had reached him daily. The defendant said he could not account for the deficiency of the quality of the milk. His cows were in good condition. Mr. Partridge told him he was responsible for the condition of the milk. It was a very serious thing for Londoners to have adulterated milk sent from the country. Many of the dealers in London had been fined heavily, and most likely the offenders were persons like the defendant. He fined him £20, and £2 7s. 3d. costs.

Charles Leaver, farmer, Hazlewood Farm, Binfield, Berks, was summoned by the Society for a like offence. Witnesses proved the delivery of the milk at the country station, and its arrival at the Waterloo terminus, where Mr. Parish, the inspector, in the presence of defendant, took samples, and took one to Dr. Muter, whose certificate showed that it was adulterated to the extent of 14 per cent. with water. Mr. Partridge fined him £10, with £2 7s. 3d. costs.

Milk Adulteration—a novel point raised.—In connection with some cases of milk adulteration heard at Crewe Petty Sessions last week, a novel point was raised. The magistrates had in three cases inflicted fines varying from 2s. 6d. and costs to 5s. and costs, when in a fourth case Mr. C. S. Brooke, the solicitor defending, pointed out that the certificate of Mr. Carter Bell, of Lower Broughton, Manchester, the analyst appointed by the county, said nothing as to any possible decomposition which might have occurred; but according to the Act, "in the case of a certificate regarding milk, butter, or any article liable to decomposition, the analyst shall specially report whether any change had taken place in the constitution of the article that would interfere with the analysis." The magistrates reconsidered their decision in the cases in which fines had been inflicted, and adjourned all the cases to decide upon the point of law.

Tea Adulteration.—At the Stockton Police Court, Henry Flint, auctioneer, was charged by Mr. *J. M. Garry, inspector of foods*, for selling tea which was not of the nature, quality, and substance of the

article demanded. The inspector stated that on the 16th of March last, owing to having several complaints made to him, he purchased a pound of tea which defendant was selling by auction in the Market Place for 10d. and 1d. duty. Defendant guaranteed the tea to be as good as that sold in the best shops in the town for 2s. and 3s. He divided it, and sent a portion to the county analyst, Mr. Edger, of Newcastle, who certified it to contain 9 per cent. more mineral matter, principally magnetic oxide of iron and sand, than is found in genuine tea. The sample, he further stated, had a most nauseous taste, a fusty, disagreeable smell when infused—being, in fact, spoiled tea, and unfit for human food. Witness also tried to use some of the tea. Mr. Alderman Knowles: You deserved poisoning if you had. Mr. W. Churchill Tayler, who appeared on behalf of the defendant, said the tea was consigned to the defendant by a person named Ainsworth, who said he was not to sell it at less than 6d. per lb. Shortly after meeting Ainsworth at Stockton the tea arrived, and defendant sold it as he received it. Mr. Knowles said it was nothing but spoiled capers, which had been wet and dried again. Mr. Tayler admitted the sale of the tea, and also that it was unfit for food, but stated that had the defendant only received a warranty from Ainsworth he would not have been responsible, and would have complied with the Act of Parliament. He, however, received some twenty chests, and that left unsold he would destroy forthwith. After hearing the defendant's statement, which bore out that of his solicitor, the Bench imposed a penalty of £1 and costs.

Heavy Fines for Milk Adulteration in Ireland.—At Castlerea (County of Roscommon) Petty Sessions, 1st June, five contractors were prosecuted by the Guardians of the Union for having sold milk adulterated with water to the extent of (as certified by Dr. Cameron, county analyst) from 25 to 30 per cent. The magistrates convicted in each case. Martin Hanley, George Fitzpatrick, and Martin Cohill, whose milk contained 30 per cent. of added water, were each fined £20, and Martin Maguire and Patrick Brooks, whose milk contained 25 per cent. of added water, were mulcted in £10 each, being a total of £80. The magistrates ordered the fines to be allocated towards the expense of executing the Sale of Food and Drugs Act.

Gin Adulteration—The "Prejudice Question."—Philip Stiles, of the Grove Tavern, Bath, was summoned for selling gin not of the nature, substance and quality demanded. Mr. F. H. Moger conducted the prosecution, and Mr. F. S. Clark appeared for the defendant. The purchase of the gin in the usual way by Mr. H. G. Montagu, Inspector, having been proved, the analyst's certificate was put in, which showed the portion submitted to him to have contained 28·5 per cent. of added water, and to be 45·5 under proof. Mr. Montagu in cross-examination by Mr. Clark, said he purchased the gin with his own money, but should be recouped by the Sanitary Authority; he did not buy it for his own use. Mr. Clark: then as far as you are concerned you are not prejudiced by this gin being under proof. Mr. Clark, in addressing the Bench for the defendant, said he should in the first place call attention to the wording of the clause in the Act of Parliament under which this prosecution was instituted. The Act said no person shall sell to the prejudice of the purchaser any article of food, &c., which is not of the nature, substance and quality of the article demanded by the purchaser. Obviously Mr. Montagu had not been prejudiced by this gin. He bought it for the purpose of getting a case, and he got a case. Mr. Hammond: Still the public must be protected. Mr. Clark: The Court of Justiciary in Scotland, which was there the highest court, had ruled that a prosecution could not be sustained. There has been no case decided since the passing of the Food and Drugs Act, which overrules that decision of the High Court of Justiciary. I contend that the public officer is not authorised by the Act to institute a prosecution under this section. Mr. Moger addressing the Bench on the point raised, said the Scotch court took a different view from the English. The point was raised before Mr. Balguy, the police magistrate at Greenwich, who ruled against it. Mr. Clark: That was before the decision I have quoted. Mr. Moger, having quoted two decisions of English magistrates antagonistic to Mr. Clark's contention, the magistrates consulted Mr. Payne, their clerk, who said he thought the point a very strong one. Prior to the decision of the Court of Justiciary the point had not been raised in any of the superior courts, and he considered that the eminent counsel who had been engaged in various cases regarded the objection as untenable. The Home Secretary had been asked in Parliament whether he would take any steps in the matter, and he said that at present he had not thought it necessary, evidently meaning to leave the case to be argued. The magistrates retired to consider the question, and on returning into Court the Chairman said they ruled against Mr. Clark. Mr. Clark asked for a case for the Superior Court, which was granted. Their worships fined the defendant £10 and costs, with the alternative of a month's imprisonment.

Important Decision as to the Purchase of Sample for Analysis.—At the Chapel-en-le-Frith Petty Sessions, lately, Thomas Needham, landlord of the Bagshaw Arms Inn, Wormhill, was charged with selling a bottle of gin to Colonel Shortt, inspector under the Sale of Food and Drugs Act, which was not of the nature, substance, and quality of the article demanded by the purchaser. The Inspector said he visited the house on the 8th of May, and asked for a bottle of gin, for which he paid her 1s., and told her "it was purchased for the purpose of analysis," and offered to divide it into three parts, but she said it did not matter. The analyst's certificate stated that the sample contained 29·4 per cent. of real alcohol, corresponding to a strength of 37½ degrees under proof; spirits of this sort would result from a

dilution of four gallons of gin at 20 degrees under proof to upwards of five gallons by addition of water. The sample contains about 470 grains of sugar and extractive matter. No injurious addition of any sort was detected. Mr. Brown, of Stockport, submitted that according to the section of the Act of Parliament the Inspector was bound to have said to Mrs. Needham that the gin was purchased for the purpose of being analysed by the public analyst, and that he was bound to use the very words of the Act. He produced a copy of the last number of the *Law Times*, in which a portion of a report appeared of an appeal against a conviction for adulteration, in which Lord Chief Baron Kelly said the inspector was bound to use the very words of the Act, and that the appeal in that case must be allowed. Under these circumstances, the magistrates dismissed the case.

At Woolwich police court recently, Edmund Singleton, of 116, Sandy Hill Road, Plumstead, was summoned for selling adulterated butter. Mr. Farnfield, clerk to the board, prosecuted in each case. Mr. Peake defended in this, stating that the shop was managed by defendant's wife, who appeared. Mr. P. James, inspector for Plumstead district, said defendant was a general dealer. He went to his shop on the 5th of March, and asked for half a pound of butter. Mrs. Singleton said she would not sell it to him as butter, but that she would let him have it as she had got it. He paid 8d. for the half pound. There was no printed or written label on the paper. He told her it was for analysis, and sent one portion to the analyst, Mr. Wigner, who certified that the sample contained 30 per cent. of foreign fat. Mr. Farnfield read a portion of the Act, to show that it was necessary for a label to be on the paper to guard against the vendor admitting the adulteration to the inspector, and saying nothing to other people. Mr. Peake said people were very well satisfied with the mixture, which was not injurious to health. Pure butter could not be sold at the price. Mr. Slade fined the defendant 20s.

Henry Chilton, of 31, Harden's Manorway, was summoned for selling adulterated butter. Mr. James deposed to buying butter at defendant's shop and sending it to the analyst, who certified that it contained 75 per cent. of foreign fat. He paid 8d. for the half pound. Defendant's wife said it was just as she bought it.—Fined 20s.

William Mahany, of 45, Raglan Road, was summoned for selling adulterated milk. Mr. James said defendant was a milkseller. On the 19th of March witness was in Upper Earl Street, when he saw a female with milk cans. He got a boy to purchase milk, and he went to the woman for a pint. She served him, and witness, on receiving it, told her it was for analysis. She said she had no business to supply him, as the milk was intended for customers. The analyst certified that the sample contained 45 per cent. of added water, and the rest was milk of the poorest quality. Defendant said his wife had only a few quarts of milk for "exercise and pocket money." Defendant's wife said her husband had no interest in the milk she sold. If he borrowed a shilling from her he had to return it. Defendant said he had a mutual agreement with his wife. Mr. Farnfield said the husband's business could not be separated from the wife's. Defendant said he did not keep a shop. Mr. Slade said the husband and wife evidently had their business in common, and lived together. He fined him 20s.

NOTES OF THE MONTH.

A few months ago some of the canny (!) Scotch Justices construed the Sale of Food and Drugs Act in such a way as to decide that an Inspector duly appointed under the Act, and purchasing under the direction of the authority by whom he was appointed, was not prejudiced by the sale to him of an adulterated article, and consequently they dismissed a case brought before them—and until this decision is upset on appeal we fear (notwithstanding the statements of the Home Secretary and Lord Advocate in Parliament) there is nothing to prevent the Act being valueless in Scotland.

Some Yorkshire Justices have now shown *their* wisdom by laying down another *dictum*, which, if accepted by the other magistrates in the kingdom—a most unlikely thing, however—would increase the difficulty of obtaining convictions in England. In the case we refer to, a report of which is printed on another page, an Inspector under the Act purchased some gin, and after purchasing it told the vendor that "it was pur-

chased for the purpose of analysis." The defendant raised the technical objection that the inspector had *not used the very words of the Act*, and produced certain reports which had appeared in legal journals to prove that he was correct in his objection. The magistrates decided that the inspector *was bound to use the very words of the Act*, and to say to the vendor that "the sample was purchased for the purpose of being analysed by the public analyst," and they therefore dismissed the case. We should think that the publication of this prosecution, with the statement of the technical quibble by which the defendant avoided conviction, would probably do him nearly as much harm as if he had paid the penalty and so have done with the thing. As for the decision itself it only affords another instance of the necessity for amending the present Act in accordance with the experience of the past few years.

There is a very neat little paragraph going the round of the papers, especially those which indulge in allusions to the amount of property left by deceased tradesmen and others, which has a certain amount of interest to analysts. A milkman—"a poor milkman," as one of the trade journals calls him—has recently died, and his personalty has been sworn under £30,000. We agree that this is a nice little sum for a milkman to leave, but what we wish to point out now is that if a milkman can make as much money as this, what possible need can there be for the existence of those so-called *dairymen* who sell nothing but milk and water.

The General Order with reference to snuff issued by the Board of Inland Revenue, and reprinted on another page, prescribes the nature and to some extent the quantity of salts which may be added to tobacco for the purpose of manufacturing snuff, and it will doubtless be read with interest by those analysts who may occasionally have to advise tobacco manufacturers. It would be amusing if it were not unfortunate to note that the chemical advisers of the Government have once more shown their peculiar fitness for their position, inasmuch as they direct that the quantity of alkaline salts, including, among others, "carbonate of ammonia," shall be determined after the snuff has been "dried at a temperature of 212° Fahr." We think that any snuff manufacturer who chooses to mix smelling salts and powdered tobaccos in equal proportions will be perfectly safe so long as he insists on the snuff being *dried* in accordance with the regulation of the Inland Revenue Department before the estimation of his fraudulent addition is made. Still it is only just to warn him that he is now liable to another fearful penalty, for if the snuff be found to contain more than 3 per cent. of tonquin beans the snuff becomes liable to forfeiture and the manufacturer to a penalty. This is a serious matter indeed, for the estimation of a small percentage only of tonnquin beans, even by an expert, may easily vary 2 or 3 per cent. from the truth.

We are glad to notice that Mr. C. W. Heaton, the well known treasurer of the Society of Public Analysts, has been appointed Public Analyst for St. Martins *vice* Anderson. This appointment is far more satisfactory than several recent ones have been.

Happy Isle of Man where all the cigars are composed entirely of tobacco, no spirits are supplied below 14·2 u.p., and the vendors of butterine do not sell it as butter. If

our tradesmen here would only all agree to act upon similar principles there would be an end of the necessity for public analysts appearing in police courts, a consummation which, in spite of the statements of the trade organs, we most sincerely wish for.

MANX ADULTERATION ACT.—The report of the inspector appointed under the Acts for the Prevention of Adulteration in the Isle of Man, for the year ending December 31st last, has just been issued. The total amount of cigars imported upon which duty was paid in the island was 1866 lbs., showing a decrease of 150 lbs. upon 1876. The cigars examined were all found to be composed entirely of tobacco. With regard to the spirits, the inspector reports that the average accustomed strength of the spirits sold in the island was 14·2 under proof. The result of the examination, the inspector states, compares favourably with previous years, as many of the samples were procured with a view to ascertain if any deleterious substance had been added to the spirits, but in no instance was any other adulteration found than water. With respect to milk only two samples were found adulterated. Some of the butter sold by retailers was not so satisfactory, but no prosecutions could be instituted, as the vendors had informed purchasers that they did not sell the article as butter.—*Grocer.*

RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
3992	F. Wirth	Treating Ammoniacal Liquids	6d.
4021	H. Conradi	Manufacture of Sugar from Beetroot	6d.
4066	F. S. Newall	Manufacture of Soda and Potash	2d.
4094	M. Neustadt	Manufacture and Production of Salicylic Acid	6d.
4118	P. Spence	Treating Spent Oxide of Iron arising from the Manufacture of Gas	4d.
4134	B. J. B. Mills	Manufacture of Gas	4d.
4142	W. Thompson	Manufacture of White Lead	8d.
4144	E. W. Parnell	Manufacture of Caustic Alkalies	4d.
4158	H. Simon	Manufacture of Soft Soap	2d.
4159	J. H. Martin	Decorticating and Polishing Rice, &c.	6d.
4272	J. D. Ellis	Manufacture of Ferro Manganese and Speigel Eisen	2d.
4275	F. W. Heinke	Producing Electric Light	2d.
4346	J. A. Stephan	Manufacture of Carburetted Hydrogen and Oxy-hydrogen Gases	4d.
4370	G. F. Cornelius	Treatment of Hydro-carbon Oils for the Manufacture of Gas, &c.	2d.
1878.			
243	C. D. Abel	Treatment of Residues from Analine Red, &c.	4d.
828	Do.	Colouring Matters for Dyeing and Printing	4d.
730	A. Sauvée	Scouring, Bleaching, and Dyeing Materials or Fabrics	4d.

Mr. C. W. Heaton has been appointed Public Analyst for St. Martin's-le-Strand.

Mr. A. Ashby has been appointed public analyst for Grantham.

Mr. A. Wynter Blyth has been appointed public analyst for the Boroughs of Tiverton, Bideford, and South Molton.

Mr. W. F. Donkin has been appointed public analyst for Banbury.

Mr. R. Oxland has been appointed public analyst for Devonport.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Medical Record; The Miller; The Anti-Adulteration Review; Journal of Applied Science; The Country Brewers' Gazette; The Dairyman; Notes on Diet, by Sydney Gibbons, Melbourne.

THE ANALYST.

AUGUST, 1878.

THE SALE OF FOOD AND DRUGS ACT AMENDMENT BILL, 1878.

A DECISION of the Lords' Justices on an appeal case in Scotland which we reported in our issue for February would, if it had been confirmed by the English judges, or by a higher court of appeal, have rendered the Sale of Food and Drugs' Act practically a dead letter. A glance at the analysts' reports which we publish monthly shows that, although the public expect to be protected from the sale of sophisticated articles as genuine ones, they will not take the trouble to purchase samples for analysis, and still more will not incur the expense of the analysis and the prosecution. This is not to be wondered at. Adulteration is unquestionably a gigantic fraud when viewed collectively, but when each single case is viewed separately the loss incurred by a single consumer is comparatively small, and it is unjust to throw on him the cost and loss of time incurred in a prosecution.

It is a remarkable and significant fact that more than half of the adulteration prosecutions are defended simply on technical quibbles. The solicitors for the defence virtually, if not in so many words, acknowledge the sophistication and then proceed to argue as to the details in which the Act passed for the prevention of this sophistication has not been complied with. It matters little to the defendants what the quibble may be, sometimes it takes the form of an inspector not being prejudiced by the purchase, sometimes the formula of words to be repeated by the inspector is alleged not to have been duly recited, sometimes the sample after division is stated not to have been properly sealed, and sometimes THE label has been forgotten; anyhow, the fact remains that technical objections are the favourite defence of the grocer, the druggist, and the publican.

Next in favour among the defences raised comes the appeal to Somerset House, and here we cannot really blame the vendors. Guilty although they may know themselves to be, it is only in human nature to appeal to the Inland Revenue chemists and see whether the watered milk from an entire dairy is really worse than that given by the poorest cow which could be found in Great Britain. The chance of success naturally may be and very often is enough to justify the appeal.

It is needless to say that all this wants altering, and that the only defences in such cases ought to be bonâ fide ones, instead of the palpable evasions of the Act in which the trade journals so much delight. Alterations in practice such as these, however, take time, and this month we have to notice merely the first instalment of a step in the right direction, a movement, however, which shows that the country—while fully recognising the right of every man to be considered innocent till he is found guilty—does not recognise the *arguments* ? of those journals which rejoice over a *victory* when a peccant grocer escapes conviction, because perforce the inspector did not personally use any of his adulterated coffee, and therefore was not prejudiced.

It is sad to see how low the standard of national morality has fallen when misdemeanants are allowed to evade the consequences of their faults in such a way, and a press, we had almost said an advertising press, can be found to support their misdemeanours. If a case is defended on its merits by all means let the benefit of every doubt be given to the accused, but if the case is defended on a technical quibble, justice demands that the benefit of the doubt, if any, should be given to the public, who have so long suffered from adulteration and fraud.

The Bill introduced by Mr. Anderson deals only with the prejudice to purchaser question. It is a Bill which ought to have been entirely unnecessary, and in our opinion it is so now. Why a Government Act passed only three years since, and which although fought most bitterly by the representatives of the adulterators, was carefully watched at every step by the present Government, should now need amendment, would be a mystery to all but those who recollect its original form. When the Bill of 1875 first appeared the words "usages of trade" cleverly, we might almost say scientifically introduced, were designed to cover old crimes, so that what had been, was to be—in other words, adulteration was to go on unrestricted until new skill could devise new modes of deceit, and then if detected the offender had a dozen loopholes out of which to escape. Fortunately the efforts made by those who wished to get what they paid for partially succeeded, and although the Bill was a compromise, it did put some restriction on adulteration, and the percentage of impure goods sold is now only about one half of what it was before adulteration, as defined by the Act of 1875, was a legal crime. Ever since that time the efforts of defendants have been directed to find flaws in the Act, or in other words, to find something which might be used to give a quasi legal sanction to fraud. To attain this end almost every one of the acting clauses of the Act has been tried, but beyond an occasional, and to our mind, erratic decision by some local magistrate, we are not aware that any evasion has been successful except in the Glasgow case.

Mr. Anderson's Bill is only intended to meet one of the points used as technical defences, but although this very point has been overruled many times both in London and the country, it is perhaps better that it should be set entirely at rest. The Bill, which we reprint on another page, contains only one acting clause, and that simply enacts what common sense would have thought was evident before, that an inspector who is really the agent, or, if it is preferred, the paid servant of the public, should, when he purchases on their behalf, be considered as prejudiced if the article is adulterated.

As we have before said, we do not think the Bill is necessary although other amendments of the Act may be, but we certainly do feel that it is a disgrace to English honour and English truth, that tradesmen guilty of fraud should protect themselves under such a subterfuge as this Bill seeks to remove, and we wonder that honest grocers, publicans and druggists do not protest against needing any such subterfuge to prove their integrity.

Meanwhile, a remedy is available. Let every Corporation, Board or Bench of Magistrates in the kingdom follow the example of the Plumstead Board of Works, and direct the inspectors to use, as food or drink, or otherwise as the case may be, a portion of every sample which they purchase. This will, no doubt, be a case of fighting the adulterators with their own weapon—sharp practice—but for once this is of little moment, so long as the public who are swindled and the honest tradesmen who are undersold, are protected.

THE DETECTION OF ALUM IN FLOUR.

If Messrs. F. M. & G. Rimmington, instead of sending their paper on the above subject to the *Pharmaceutical Journal*, had read it at one of the meetings of the Society of Public Analysts, they would not only have assisted the Society in the discharge of one of its main functions, viz., the improvement of our methods of food analysis, but they would also have had the personal advantage of hearing the remarks of some of their fellow-workers on the same subject.

They would thus have learnt, firstly, that whatever may have been their own practice, public analysts in general have *not* been in the habit of relying *solely* on the estimation of the alumina for the detection of alum in flour; secondly, that dialysis has already been tried for the purpose of separating the sulphuric acid of the alum from the flour to which that salt had been added, but that the process was found to offer no advantage to compensate for the time occupied. The chief obstacle opposed to the ready and accurate estimation of sulphuric acid in the aqueous or weak alcoholic solution of the flour is the presence of certain organic substances, and these dialyse with the sulphuric acid. Messrs. Rimmington do not appear to have discovered this fact. Thirdly, they would have learnt that flour has the power of abstracting alumina from a solution of alum; that, therefore, the alumina cannot be extracted by means of water from a flour to which alum has been added, and, therefore, of course it cannot be separated by dialysis.

The results they have obtained with the logwood test would, however, have been news to the Society, and could we only believe in their accuracy, would put an end to all further difficulty, except on the side of the bakers. The detection with certainty of 1-33rd of a grain of alum when added to 4lbs. of flour exceeds even our most sanguine expectations, and millers and bakers will have to take care in future to keep under this limit if they do not wish to bring themselves within the four corners of the Sale of Food and Drugs' Act.

ON THE NITROGEN COMPOUNDS PRESENT IN THE CEREALS.

By G. W. Wigner, F.C.S.

[*2nd Paper.*]

In the preliminary note on this subject, published in the Analyst for July, I pointed out that the nitrogenous flesh-forming constituents present in wheat, oats, and barley had been over estimated, because nitrogen combined as nitric acid—nitrous acid and alkaloids, and probably nitrogen in other forms, existed in these grains in larger quantities than had been hitherto supposed, as had already been pointed out by Church to be the case in roots and many other vegetable products. The investigation is, of course, too lengthy to admit of rapid completion, but I purpose giving some more details as to the process adopted, and its results on a certain number of samples of wheat.

The mode in which I prepare the grain for analysis must necessarily give results slightly different from those which would be obtained from millers' flour and bran, because it is impracticable to grind or dress a small sample in the same perfect manner as a miller dresses his flour. In the miller's case the flour would, of course, be ground between stones and dressed through fine silks. In my case, owing to the limited quantity of each sample available, I am compelled to be satisfied with grinding and

dressing of a far less perfect character. The mode which I adopt is to grind the whole grain in a coffee mill, set to as fine a cut as possible, and then gently sift it through a sieve with 80 holes per linear inch, avoiding as far as possible any pressing or grinding action on the sieve. The first bran which does not pass through the sieve is ground down again in the coffee mill and sifted, and the residue is submitted to the operation once more. By this means by far the larger proportion of the flour is separated from the bran, but an unduly large proportion of the bran is so disintegrated by the grinding that it passes through what is the comparatively coarse sieve used. I have found it impracticable to "dress" the quantities available for analysis through silk, because the grinding could not be efficient enough to enable all the flour to pass through the silk sieve.

The net result of the operation is, therefore, that my flour contains too much bran, and my bran too much flour, or, in other words, the separation is not so complete as the miller would make. I do not think that this interferes sensibly with the comparative results.

The coagulation of the true albuminoids is carried out exactly as described by Church in the last edition of the "Laboratory Guide."* 50 grains of the sample is ground in a warm porcelain mortar with enough warm saturated aqueous solution of carbolic acid to form a paste. Two or three drops of dilute acid are added to prevent the alkalies present from dissolving or holding in solution any of the coagulable matters, and the paste is then diluted with hot carbolic acid solution and filtered when cool. The residue on the filter is washed with carbolic acid solution of the same strength. By this treatment all the true albuminoids are coagulated and remain on the filter while any nitrogenous compound present either as nitrates or nitrites, or as alkaloids or gluten, passes through in the filtrate. The residue on the filter is washed down into the point as far as possible and the filter is then dried—the residue detached, and the filter itself finely shredded with scissors and ground to a powder, which is intimately mixed with the residue.

There is, of course, no difficulty in the process itself except its tedious character. The filtration will generally occupy 36 hours, and sometimes more, and the pulverising of the filter is an operation requiring much patience. My practice is to weigh the mixture of the insoluble residue and the pulverised filter, and to divide it into two portions for duplicate combustions if necessary.

As to the filtrate a portion may be taken for the determination of nitrogen as nitrates and nitrites, provided, of course, that nitric acid has not been used to acidify the paste with. A to the other nitrogenous constituents which are not coagulated, all I can say at present is that part is present as alkaloids, and, I believe, part also as gluten.

My experience of this process makes me quite satisfied with its results; with reasonable care there is no fear of error (as repeats give very closely accordant results), and there can, I think, hardly be two opinions as to the importance of the new data which are given for determining the true value of the nitrogenous ingredients in the cereal grains.

I pass now to a further consideration of the results obtained from some more experiments on wheat, I must leave the completion even of this series, and also the oats and barley for later papers.

* Church's Laboratory Guide. Van Voorst. 1877. 4th edition.

I must premise that the samples which I examined were not *average* wheat, but, on the contrary, they were samples carefully selected by Professor Tanner, to whom I am much indebted in the matter, so as to give examples of every class of wheat, *i.e.* good, bad, and indifferent, special care being taken to select samples of wheat in which the conditions of soil, or climate, or seed were known and were different. It is naturally to be expected, therefore, that samples obtained under what, for the purposes of such an enquiry, must be considered as most exceptional circumstances, should give variable results, and should differ in the averages from the estimations previously made by those who worked on commercial samples only.

The following table shows the results obtained by the combustion of 15 samples of whole meal from wheats, together with the results obtained from the same samples, after treatment with carbolic acid as already described, and the ratio shown to exist between the true albuminoids and the albuminoids calculated from the total nitrogen found by the combustion process.

TABLE I.—WHEAT.

Nitrogenous matters present in the whole meal of 15 samples of Wheat compared with the coagulable nitrogenous matters.

Nitrogenous matters = N × 6·33. All results in percentages.

MARK.	Nitrogenous matter in whole Meal.	Nitrogenous matter coagulated by carbolic acid.	Nitrogenous matter not coagulated.	Percentage of true gluten calculated on total nitrogenous matter.
A	11·54	10·14	1.40	87·9
B	9·14	7·39	1·75	80·9
C	8·53	7·89	0·64	92·5
D	9·41	8·65	0·76	91·9
E	9·52	6·27	3·25	65·9
F	10·66	8·15	2·51	76·4
G	9·40	7·89	1·51	83·9
H	9·28	7·52	1·76	81·0
J	9·53	7·02	2·51	73·7
K	9·15	7·27	1·88	79·4
L	9·15	6·77	2·38	74·0
M	11·28	10·15	1·13	90·0
N	8·03	7·65	·38	95·3
O	10·02	7·64	2·38	76·2
P	13·79	11·01	2·78	79·8

Of course the first point which attracts attention is the great differences between the samples, but this is due greatly to the fact that they are representative and not average ones. The differences between the total albuminoids are considerable, but the ratios of the differences in the non-coagulable albuminoid matters are far greater. It will be seen that the latter vary from 0·38 to 3·25, or from about 66 per cent. to about 95 per cent. of the albuminoid matters found by the original combustion. It is worth note that samples with the lowest total nitrogenous matter shows the largest percentage of albuminoids present in an uncoagulable form. There can be no doubt about the results for they were repeated and gave accordant figures, but they are none the less singular.

I pass now to the results obtained from the so-called bran, I say so-called, because, as I have before explained, the bran really contains some flour, and here we get the following very interesting results, which are tabulated in the same form as those obtained from the whole meal. The bran was obtained from the same samples of wheat.

TABLE II.—WHEAT.

Nitrogenous matter present in the bran of 15 samples of wheat compared with the coagulable nitrogenous matters.

Nitrogenous matters = N × 6·33. All results in percentages.

MARK.	Nitrogenous matter in Bran.	Nitrogenous matter coagulated by carbolic acid.	Nitrogenous matter not coagulated.	Percentage of true gluten calculated on total nitrogenous matter.
A	13·42	5·69	7·73	42·4
B	13·60	8·10	5·50	59·6
C	11·77	...	*	...
D	8·67	3·54	5·13	40·8
E	7·43	5·69	1·74	76·6
F	9·33	8·10	1·23	86·8
G	10·57	9·49	1·08	89·8
H	11·01	7.72	3·29	70·1
J	11·65	10·25	1·40	88·0
K	10·05	6·46	3·59	64·3
L	11·24	7·46	3·78	66·4
M	10·76	8·48	2·28	78·8
N	8·23	6·71	1·52	81·5
O	9·24	4·81	4·43	52·1
P	15·66	8.73	6·93	55·7

Two points at once attract attention here—first the great difference between the coagulable and non-coagulable albuminoids, and secondly, the difference between this ratio and that found when the whole meal was similarly treated.

(To be continued.)

IMPORTANT STATEMENT BY MR. SCLATER-BOOTH.

The Adulteration of Food Act.—At the Hampshire Quarter Sessions, held at Winchester, Mr. W. C. D. Esdaile asked the Right Hon. G. Sclater-Booth, M.P., President of the Local Government Board and Chairman of the County Finance Committee, whether his attention had been directed to a decision recently given in Westminster Hall on the adulteration of Foods Act, which in effect rendered that Act nugatory, and also whether he had considered the advisability of recommending that no further samples should be collected for analysis until some amendment of the law had been made or that decision reconsidered? Mr. Sclater-Booth replied that his attention had been directed to a decision in the High Court of England, and another in the Sessions Court of Scotland upon questions arising under the Adulteration of Foods Act, but he was hardly in a position to give a definite opinion on the subject, the papers having reached him only yesterday. So far, however, as he knew, it appeared that what Mr. Esdaile had called a decision of the High Court of Justice was in reality the arbitrary dictum of one learned judge, and until that had been appealed against it would not be right to assume that the Act of Parliament had broken down in one important particular. The Court in Scotland had come to a decision which was certainly surprising to him, and if the Courts of England should take the same view of the existing law it would probably be that an amended Act would be introduced at the joint instances either of himself or some one on his behalf and the Lord Advocate. He did not see that they were bound by the recent decision at Westminster, and he should not be disposed to put any restriction at present upon the collection of samples.

* Spoilt in analysis.

SALE OF FOOD AND DRUGS ACT (1875) AMENDMENT.

A Bill to Amend the Sale of Food and Drugs Act, 1875.

The following is the text of the "Sale of Food and Drugs Act Amendment Bill," just introduced into the House of Commons, by Mr. Anderson, Sir Wilfred Lawson, Mr. P. A. Taylor, and Mr. Whitewell:—

WHEREAS doubts have arisen as to the bearing of certain provisions in the Sale of Food and Drugs Act, 1875, through which doubts it has become impracticable to enforce portions of that Act in the interests of the public health.

Be it enacted by the Queen's most excellent Majesty, by and with the advice and consent of the Lords spiritual and temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:—

1. This Act may be cited for all purposes as the Sale of Food and Drugs Act Amendment Act, 1878.

2. In any prosecution under Section 6 of the Sale of Food and Drugs Act, 1875, a sale of any article of food or any drug shall be held to have been made to the prejudice of the purchaser if such article of food or drug is not of the nature or substance or quality demanded, although such article of food or such drug may have been purchased for the purpose of analysis; and the seller shall be held to be guilty of an offence against the said Section if the article of food or the drug sold by him is proved to be not in all respects of the nature or substance or quality of the article demanded, and it shall be no defence to any such prosecution to allege that the purchaser, having bought only for analysis, was not prejudiced by such sale.

The Bill has since been read a second time, and Mr. Isaac has given notice of his intention to move as an amendment to change the word "or" occuring twice in the fifth line of the second clause, and printed in italics in the following, into "and," and to omit the whole of the latter part of the clause, also printed in italic.

Proposed Amendment of clause 2.

2. In any prosecution under section 6 of the Sale of Food and Drugs Act, 1875, a sale of any article of food or any drug shall be held to have been made to the prejudice of the purchaser if such article of food or drug is not of the nature *or* substance *or* quality demanded, although such article of food or such drug may have been purchased for the purpose of analysis; *and the seller shall be held to be guilty of an offence against the said section if the article of food or the drug sold by him is proved to be not in all respects of the nature or substance or quality of the article demanded, and it shall be no defence to any such prosecution to allege that the purchaser having bought only for analysis was not prejudiced by such sale.*

THE DETECTION OF ALUM IN FLOUR AND BREAD.

By F. M. and George Rimmington.

Abstracted from the Pharmaceutical Journal and Transactions.

THE authors state that hitherto the detection of adulteration of flour and bread by the addition of alum has been entirely based upon the assumption that the alumina phosphate found above a certain percentage existed as a soluble salt of alumina, or, in fact, that an addition of alum had been intentionally made.

They first attempted the estimation of the sulphuric acid; the estimation of the ammonia or the potash appearing beyond the power of analysis. Three modes suggested themselves, viz., combustion, solution (elutriation), and dialysis. Combustion was a failure; solution, that is, by mixing a certain portion of flour with a diluted solution of alcohol and filtering out the solution and rendering it clear by boiling, or the addition of acetic acid, and precipitation by chloride of barium, proved much more practicable and satisfactory, and it is strong confirmatory evidence.

The authors next state that dialysis yielded results that have given strong hope that it is to be the process of the future.

Their mode of procedure is as follows:—Take 50 grams of flour and put into a litre flask 200 c.c. of rectified spirit and to this add the flour and agitate until a perfectly smooth mixture is effected, then add distilled water to make up the measure to one litre. This is allowed to stand with occasionally shaking for twenty or thirty minutes and then poured upon a large filter. Take any proportion of the filtrate and place it in a dialyser and allow it to dialyse twelve hours; at the expiration of that time pour out the dialysate into a beaker and put more water in the dialysing dish and continue the process for another twelve hours, and it may be repeated the third and fourth time until no trace of sulphuric acid is obtained. These solutions may be dealt with separately or collectively by evaporation to a small volume and the sulphuric acid precipitated by a barium salt, collected and weighed. Any salt of sulphuric acid that is present in the flour must make its appearance in the dialysate, and the only problem to settle will be its proportion to the alumina found by incineration. The dialysate may likewise be tested for alumina. Should the amount of sulphuric acid be small or insignificant, it must not be ascribed to alum, but to one of the constituents of the flour, and flour does contain a small quantity of this acid in some combination or other.

The authors find the logwood test most valuable and extremely delicate. They state that it is capable of detecting alum as distinctly as Marsh's test will detect arsenic, 1 part in 1,000,000. And further that there are several kinds of logwood in use, and some of these are useless for the purpose.

ALUM IN BREAD.

From "*The Echo.*"

Some legislative action will have to be taken to control the vagaries of the "Great Unpaid" if the Adulteration Act is really to become a living law instead of an enactment to be evaded. The authorities who dismissed a clear case because the inspector failed to state in the exact words of the Act that he intended to have the articles analysed may be complimented on their sharpness, but scarcely on their intelligence. The Government analysts at Somerset House have done their best to render the Acts abortive; they could not have done more if their salaries had depended on the success of their opposition; and in a recent case of flour adulteration they shine with a remarkable brilliancy. It is a difficult thing to detect alum in bread, because the alum is changed in the chemical processes of fermentation and baking, and it is almost equally difficult to detect it in flour. The soil in which wheat is grown always contains *alumina, the stones* by which it is ground are repaired with cement containing that

substance, and no method has yet been devised for estimating the amount of added alum which would be deemed entirely satisfactory by the magistrates. The public analysts, however, have good reasons for believing that their analyses give correct results, but they are thwarted by the negative evidence given by the Government chemists, who persistently ignore their work and adhere to the old methods. It is quite time, both in the interests of the public and tradesmen themselves, that these burning questions should be settled. At present the Adulteration Act is little better than a *caput mortuum*, so far as preventing sophistication is concerned.

REVIEWS.

INDUSTRIAL CHEMISTRY.*

Of all the critics with whom we are acquainted, the Editor of the *Pharmaceutical Journal* is, as a general rule, the most exacting. In the criticisms published in that periodical the smallest slips are taken note of, and discoveries made since the work was in type are unhesitatingly pointed out as deficiencies. The mention of matters which in the hands of such a critic are "simply beyond criticism," become, when subsequently treated by a more humble authority, undesirable excresences. All this would lead us to suppose that when the editor of that journal did speak in his private capacity, he would be strictly original, grammatical, and above all, down to the latest date with everything. But we are sorry to admit, after a careful perusal of this work, that we are reluctantly placed in the position of the old Scotch woman mentioned, we think, in Dean Ramsay's Reminiscences, who, while listening to the periods of a youthful preacher, remarked occasionally "that's Chalmers," or "that's Scott," but when he came to the end and gave the benediction, exclaimed "that's yoursel' noo." It is irritating to find that after reading pages evidencing the masterly hand of the original author, you suddenly meet with the "that's yoursel'" of the English editor.

A number of subjects have been added to the original, some without any apparent reason, as they are things supposed to be known to the most elementary student of chemistry. Anyone using such a book for information on the subject of chemistry as applied to manufactures, would be far beyond the necessity of requiring to be tutored in the mere rudiments of the science, such as are contained in the fourteen opening pages. Can it be possible that these were added to show what the editor really could do in chemical philosophy?

Why a few of the less interesting metals such as Titanium, Niobium, and an old explosive, Pyroxam, should be honoured with copious details, whilst such subjects as Dynamite, Gun Cotton, the Picrates, and the Fulminates are scarcely mentioned, is at first sight somewhat difficult to understand. We need not go far however, to discover that the German edition has been somewhat blindly followed, and this will account for the work not being up to so recent a date as might have been expected. Had the careful wording of that work been followed and actually translated, such a ridiculous expression as that regarding paper making would not have occurred. On page 634 of Dr. Paul's translation, the fibres specially prepared for paper manufacture are called

* *Industrial Chemistry.* A Manual for use in Technical Colleges and Schools, and for Manufacturers, &c. Based upon a translation, partly by Dr. T. D. Barry, of Stohmann and Engler's German edition of Payen's "Précis de Chimie Industrielle." Edited throughout and supplemented with chapters on the Chemistry of the Metals, &c., by P. H. Paul, Ph. D. Illustrated with 698 engravings on wood. London: Longmans, Green & Co. 1878.

"*surrogate*," while the original German of "*surrogate für die Lumpen*" simply means *substitute* for rags. It is surely a pity that the plain English was not adopted. To an Englishman the word *surrogate* is rather too suggestive of an unpleasant form of law.

The composition and translation are often rather weak; thus on page 314 the writer has such an affection for the word *glass* that he repeats it more than forty times in sixty-seven lines. In other parts of the book we are treated to such unmathematical expressions as the *diameter of rectangular bodies*, and we have such important pieces of information as "crude borax admits of being purified," and "kelp is the ash of *land* and marine plants." Nor is the acquaintance with modern commercial processes particularly extensive; the aniline dyes being honoured with scarcely more than a mere mention, and such subjects as anthracene and the other important derivatives of coal tar are dismissed with a few lines.

In the preface the author speaks as if the book were addressed not only to manufacturers, but also to the "general introduction of chemistry into schools." In our opinion the attempt to unite two such subjects is perfectly hopeless, and this may account for the manner in which many of the really useful portions of the work have been revised, in contradistinction to the part occupied on matters of interest only to the purely scientific student.

Much has doubtless been published since the last number of the German work in 1874, and it therefore behoves modern manufacturers to acquaint themselves with many processes which have no place in the present work. For instance no mention is made of the modern method of working nickel ores, or of ice-making by Carre's machine, or of kamptulicon, &c., and many other English manufacturing processes.

The book is clearly printed, but burdened by much unnecessary verbiage respecting history and modes of discovery, which have no interest to manufacturers, and the arrangement of the whole would, we think, have been much better if in a dictionary form.

We do not stoop to take advantage of the numerous misprints as subjects for criticism, but simply say that many of them are such as to induce a real misunderstanding of the context. The articles which have passed unscathed from the original are admirable, and we should say will be found of the greatest use to the technical students of such specialities.

It is to be hoped that the next edition will be edited with more care, and that much of the chemistry of the rarer substances will be expunged, and the commercial processes brought down closer to date. If this be done and the revision of the proof sheets be entrusted to a person who will more satisfactorily perform that duty, the book will be more worthy of Dr. Paul's reputation as an editor.

AIDS TO CHEMISTRY.*

By C. E. Armand Temple, M.B., &c.

This is one of the little "aid" series of books at present being issued by Messrs. Baillière & Co., specially designed for medical students preparing for examination. It is scarcely possible to review it as it belongs to the class of "cram" books which every journal which would be called respectable is in duty bound to decry. Candidly, however, we do not hold with such wonderful assumptions of anti-priggishness, and must admit

* London: Baillière, Tindall & Cox.

that given the dictum that there is a use for everything, even "cram" books are not without their benefits in often helping the lame duck over the stile. If there were no such persons in the medical profession the great ones would not be able to shine with such refulgence. Indeed, the stereotyped denunciations of "cram" too often mean that the endowed lecturer is too busy to take any interest in his students, and in consequence men who really try to impart instruction and succeed are dubbed "crammers."

Admitting the possibility, then, of touching a "cram" book now and then without soiling ones moral principles, we must say that for cheapness, good print, and perspicuity, Messrs. Baillières' "Aid" series are all that can be desired by a medical student desirous of brushing up his rusty knowledge before examination.

POISONOUS ICE CREAMS.

A LETTER, dated from the vague address "Belgravia," has appeared in the *Times*, calling attention to certain alleged cases of poisoning by ice creams. Unfortunately the letter, like most of its class, indulges in generalities such as "poisoning by some metallic irritant," and talks about the poisonous nature of the colours used, but the one specific step which the writer might have taken, namely, to submit a sample to the public analyst, has of course, been omitted, hence we are not likely to know what the metallic poison was.

It seems well to point out to public analysts that there are two possible ways in which metallic poisons may be introduced into ices.

It is well known that a good many samples of magenta do contain arsenic, and magenta is certainly used in some cases for colouring ices; here then is a possible, though we think improbable, source of metallic poisoning.

Again, the metal of which the freezing cans are made is often of very bad quality, and when acid is used to give the tartness of flavour, which is desired in some ices, it is quite possible that some lead, and perhaps some antimony also may be dissolved. The danger from this source is certainly greater than from the one previously mentioned.

It is, however, much more probable that any injurious effects which have been produced, are due either to the indiscriminate use of ices by children when heated by over exertion, or surfeited with a quantity of indigestible food, or to the use of decaying fruit in the making of the ices. Analysis could do nothing in either case, for even microscopical examination would fail to detect damaged strawberries after they had been smashed and semi-frozen.

No doubt samples will soon be purchased and submitted for analysis, and we have therefore pointed out what in our opinion are the points to which examination should be directed.

A correspondent writes to the *Times* to point out the dangers of poisonous ice creams. He says "that "these tempting delicacies are not harmless, two cases lately under my observation prove. In one case, the "patient, a child about seven years of age, was seized with alarming symptoms of poisoning by some "metallic irritant, which at one time threatened to prove fatal. In the other case also, a child, similar "symptoms manifested themselves, though of a milder type. In both cases the cause was the subject of a "searching investigation, and was ultimately clearly traced to the children having partaken of coloured ices "at a street barrow. The colours represented in these ices are usually red, pink, yellow, and green, and in "some instances blue. How the various colours are imparted to the article, sold at so low a price, and "usually consisting of a *maximum* of ice with a *minimum* of what in the East-end is called cream, is a "secret possessed probably only by the manufacturer himself. Whatever its nature may be, the above "instances show that not only is it not harmless, but in some cases absolutely poisonous."

ANALYSTS' REPORTS.

At the Somerset Quarter Sessions, Mr. W. W. Stoddart, the county analyst, presented his quarterly report. The document set forth that during the last quarter 147 samples had been submitted to him for analysis—two by the general public, and the rest by police superintendents; and, before giving the full details, Mr. Stoddart said the result was satisfactory, as only twenty six of the samples were found to have been adulterated. Mr. Welman (magistrate) remarked that the remuneration of the analyst was much in excess of that given in Devonshire, where the population was about the same. Mr. Speke, another magistrate, said he had looked through the list of articles analysed, and they all seemed to be pepper, mustard, and tea. While no end of pepper, mustard, and tea appeared to have been analysed, there was only one sample of beer. Mustard, pepper, and tea were only used to a limited extent, and would hurt nobody; but, considering the injurious forms of adulterated beer and spirits, it would be far more useful to the poor if examination were directed by the county analyst to those liquids. The Chairman said he had no doubt the Chief Constable would see to this. The Chief Constable intimated his readiness to fall in with any suggestion of the Court.

Mr. J. Carter Bell, Public Analyst for Cheshire, reported to the Court of Quarter Session for that county, that during the past quarter he had examined 44 samples of whiskies, 30 gins, 1 rum, 34 milks, 31 violet powders, 5 coffees, 5 peppers, 4 mustards, 4 teas, 1 vinegar, and 1 lard. He found 59 of them were adulterated. 9 violet powders, which should have been made of pure starch, were almost entirely composed of sulphate of lime, and, as violet powder was chiefly used as a soothing agent for infants' excoriated skin, the sulphate of lime, being in a fine crystallised state, would act as an irritant instead of a sedative.

At the Warwickshire Sessions, Dr. Hill, the county analyst, reported having had 23 samples of food and drink sent for analysis during the quarter. Of these 17 were sent by the inspector of the notorious Meriden district, and 6 from the Aston district. Of these samples 11 from Meriden were adulterated, and all from Aston, namely, 4 of coffee, 1 of milk, and 1 of rum.

Dr. Campbell Brown, the analyst for Lancashire, reports, that during the year 675 samples had been analysed, of which 152 were found to be such as constituted offences against the Act, and 18 were doubtful. Milk was found to be mixed with water in proportions varying from 5 to 60 parts to 100 parts of milk, or was deprived of a very large proportion of its cream; butter contained a fraudulent quantity of water; bread contained alum; and spirits were mixed with an excessive proportion of water, and were frequently raw spirits coloured. Ale contained excess of salt; tea was weighted and coloured with mineral matter, but not to a great extent; coffee was mixed with chicory; preserved peas were coloured with a poisonous salt of copper; cheese was badly prepared and unwholesome; mustard contained flour; and the 2 samples of drugs (1 of which was made up from the prescription of a medical man) were entirely wanting in the principal constituents. The total number of prosecutions was 92; convictions followed in 87, 4 were dismissed, and 1 was withdrawn. The penalties amounted to £235 19s., or within £8 of the previous year; and the costs amounted to £100. Although the number of offences detected was only 7 more than those of last year, and the number of prosecutions and convictions the same, a greater number of samples had been analysed to furnish those cases, so that the percentage of offences had fallen from 27·35 last year to 22·52 this year, and the percentage of convictions from 16 to 13½. It was ordered that this report be printed with the proceedings of the Court.

Mr. E. W. T. Jones, Analyst for the County of Stafford, reports having analysed 231 samples, of which only 31 were adulterated. These consisted of 1 alumed bread, 5 coffees containing chicory, 2 diluted gins, 5 mustards containing flour, 16 watered and skimmed milks, and 1 tea containing lie tea.

Dr. Swete, the public analyst for Worcester, reports:—"During the last quarter I have received 28 articles for analysis; of these 12 were samples of milk, of which 6 were rich good milk; 6 were wretchedly poor, but being within the very low standard I am obliged to consider them genuine. Beer, 3 samples: 1 from Upton-on-Severn, genuine; 1 from Malvern contained a large quantity of salt, the presence of a considerable quantity of sulphate of lime as well led me to consider the mineral nature of the water used to be the source of the *chlorine* found. One from Stourport is in my opinion salted, but as the chemists of Somerset House having recently declared a sample of beer with 68·5 grains of salt to the gallon genuine, *I am also bound* to give the benefit of the doubt to the vendor. The samples of pepper, oatmeal, and tea were all genuine. Violet powder: Considerable anxiety having arisen from arsenic being added to violet powder, I have received 2 samples fram Stourport, which do not contain any poisonous ingredients, I think the arsenical violet powders will be limited to the east of England, one manufacturer having (probably unintentionally) permitted arsenic to be mixed with the cosmetic at Chelmsford. Violet powder has no fixed composition, each manufacturer having his own receipts for the ingredients, but I do not think arsenic would be added as a common adulteration. Four samples of mustard, 1 of mustard condiment, and 1 of coffee, are still under examination." The report was adopted.

Mr. Heisch reports as follows:—Lewisham, 20 samples received, 16 milk, of which 13 were genuine,

1 contained 30 per cent. added water; 1—22 per cent.; and 1—20 per cent., this last was also skimmed; 2 butter, genuine; 2 violet powder, 1 contained 29 per cent. gypsum; 1—54 per cent. ditto, the rest being starch. Parish of St. John's, Hampstead, during quarter ending July 25th, 17 samples were analysed, milk 8, of which 1 was evidently derived from a diseased cow, and contained blood, pus, and pieces of skin, and Blyth's bodies, and 1 contained only 1·2 fat, the rest were genuine; 9 violet powder, of which 5 were either all starch or contained only 4 or 5 per cent. of Fuller's earth; 2 were entirely gypsum, 1—45 per cent. gypsum, the rest starch; 1—47 per cent. gypsum, and the rest starch.

A correspondent writes to the *Chemist and Druggist* to point out that some time since a number of oysters sent from Oran to Orleans were observed to possess a marked green coloration, the taste was peculiar, tart, and somewhat bitter; on being placed for some time in contact with a polished iron surface a thin layer of metallic copper was deposited. M. Balland ascertained by electrolysis the amount of copper present, and found it to average three milligrammes in each oyster without the shell. Many persons partook of these oysters without any injurious effects. He adds: "of course the addition of copper to food merely for improving the colour of the same must be kept in check, and I do not write with a view of defending such practice." We should think not.

CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

To the Editor of "The Analyst."

Sir,—Having recently examined a large number of samples of violet powder, I have been much struck by the variety of articles sold under that name, and I am inclined to ask the old question, what is violet powder? It is usually believed to consist of starch, and some scenting material, e.g. orris root; but I observe that in a recent case when a dealer was prosecuted for selling violet powder, not being of the quality of the article demanded, he set up the defence that any thing not injurious, might be sold as violet powder, as there is no recognized formula for it, and this defence was considered good by the magistrate, unfortunately the report did not say of what the powder consisted. Now it seems to me that if the powder is not of such a nature as to answer the purpose for which it is intended, it comes within the meaning of the 6th clause of the Sale of Food and Drugs Act, though it may contain nothing absolutely deleterious. The purpose as I believe for which violet powder is used, especially in the nursery, is as a desiccant, and to prevent chafing. The question, therefore is, will the articles sold answer these purposes properly? Now, the substance I have most frequently found in the violet powders of commerce is ground gypsum in sharp crystalline particles and fully hydrated, the quantity varying from 29 per cent. as a minimum, to 100 per cent. as a maximum; fully two thirds of the samples examined varied within these limits. How hydrated sulphate of calcium can act as a desiccant I cannot conceive, and the sharp crystalline grains would I should think, if applied to an irritable skin, be anything but soothing. Ought not the sale of such powder to be stopped? No one would purchase it if they knew what it was, yet it can hardly be said that gypsum is a deleterious substance, though I believe under certain circumstances it would produce deleterious effects.

July, 1878. CHARLES HEISCH.

From the "Pharmaceutical Journal."

VIOLET POWDER.

Sir,—In common, no doubt, with other analysts, I have received a great number of samples of violet powder for analysis, and without offering an opinion as to what the composition of articles bearing that name ought to be, I have considered it my duty to endeavour to allay any unnecessary alarm which recent lamentable accidents connected with the use of such articles have tended to produce. You have, I think, sufficiently indicted in your leader last week that the term "violet powder" is applied to several preparations, differing greatly in composition, and not always used for the same purpose. I can fully confirm your statement that there are two principal varities of so-called violet powder in commerce, starch forming the basis of one, and hydrated sulphate of calcium that of the other, while there are several sub-varieties produced by the addition of other ingredients. But while I admit the justness of your remarks in some respects, I cannot agree with your implied objection on merely inferencial grounds to the use of hydrated sulphate of calcium as a dusting powder. It has been long and very extensively used, without, as I am informed, any fault having been found with it, and in cases that have come under my immediate observation it has proved very beneficial, and in the estimation of those using it sometimes preferable even to starch.

T. REDWOOD.

From the "Pharmaceutical Journal."

Sir,—I have been connected for more than forty years, man and boy, with the retail drug trade, and have during that rather lengthened period always understood that what is called "violet powder" was a composition of starch powder, orris root powder and a little perfume; the first article being about 95 per cent. of the whole. It seems, however, that I have been mistaken, and that terra alba, magnesia, etc., are the legitimate ingredients. When such an authority as Professor Redwood speaks, there is nothing left for a humble mortal like myself then to "baisser la tête et croire."

DUM VIVO DISCO.

LAW REPORTS.

Selling Fictitious Butter.—Ann Southall, grocer, of Portobello, was charged with selling adulterated butter. On the 29th of April, Samuel Toy, assistant to Mr. Horder, Inspector under the Adulteration Act, visited the Defendant's shop, and purchased a quantity of butter. A portion of it was sent to Mr. Jones, the analyst, who certified thas it did not contain a trace of butter, but was a ficticious article. The defendant said she bought it for genuine butter. Mr Spooner: You shall not sell such a thing, poisoning people. Defendant said Toy asked for butter at a 1s. a pound. Mr. Spooner: You will be fined £5 and costs.

Butterine.—At the Liverpool Police Court, Mr. WilliamHolmes, provision dealer, was summoned for selling butterine as butter. Inspector Ibbs stated that on May 31 he visited the defendant's shop and asked to be served with a pound of butter, which he received and paid 6d. for. He then told the person who served him who he was, and that he should have the butter analysed, and the reply was made that it was "all right," as it was labelled, and witness's attention was called to a label on a tub of butter outside the shop with a large figure of 6 printed on it, and underneath in small print the word "butterine." The tub from which witness was served was not labelled, neither was the paper in which the sample was wrapped. Mr. Atkinson said that Dr. Brown, the borough analyst, had analysed the sample, and reported that it was "perfectly clean and wholesome, and was a good substitute for butter. Mr. Raffles: Then why do you prosecute them? Mr. Atkinson: We prosecute them because it must not be sold as butter. Mr. Raffles (To Inspector Ibbs): I suppose you knew perfectly well that you could not get butter for 6d. a pound. Inspector Ibbs: Well, I get it higher up the road for 6d. a pound. Mr. Raffles: What! pure butter? Inspector Ibbs: Yes. Mr. Raffles remarked that the person who sold pure butter at that price ought to get plenty of custom. Mr. Segar, on behalf of the defendant, contended that the spirit of the Act of Parliament had not been infringed, and said that the defendant had gone to Dr. Brown, and the latter had told him that he ought to affix a label on the article. Mr. Raffles said that if the defendant had put a paper round the article and stated that it was butterine, he would have been all right; but he had not done so. He must pay 5s. and costs.

Important Judgment. — Sandys *v.* Small. — In the High Court of Justice, Queen's Bench Division, Westminster, the Lord Chief Justice and Mr. Justice Mellor, heard the case of Sandys *v.* Small, which was an appeal from a decision of the justices of Derbyshire in a case where defendant, a publican at Langley Mills, was charged with selling whiskey adulterated with water in contravention of the terms of the Food Adulteration Act. The appellant is inspector of nuisances for the county of Derby; and in March last he sent a man named Slack to the Defendant's premises, where he purchased half a pint of whiskey, which was afterwards found mixed with water, upon which the defendant was proceeded against under Section 6. The magistrate, however, dismissed the case on the ground that the terms of the Act were complied with by the publican, inasmuch as he displayed in conspicuous positions in his bar-parlour and smoking room, cards containing the intimation that all spirits sold in that establishment were mixed; and, further, that the inspector, and not some one on his behalf, was the person to have purchased the whiskey, if it was alleged he was prejudiced by the sale. The justices now submitted a special case for the decision of the Court, Mr. Wills, Q.C., appearing for the appellant (the inspector), and Mr. Mellor, Q.C., for the respondent (the publican). The Lord Chief Justice remarked that the inspector was to see that no frauds were practised by the sale of inferior articles. But when the inspector knew that no fraud was practised or attempted to be practised, was not the prosecution a vexatious one? Mr. Wills: The man swore that he did not. The Lord Chief Justice: He swears by the card in saying that he did not see it "at the moment" he bought it. The man bought it with his eyes open, and I cannot imagine any moral delinquency. Mr. Wills: Then I shall ask to have the case remitted, to have the fact found out whether the inspector had notice. The Lord Chief Justice: Then Section 14 says that the person purchasing the article with the intention of having it analysed shall "forthwith" notify his intention of having it analysed by a public analyst. Now, he did not do that; he sent another man to make the purchase. Mr. Justice Mellor: And there might be tampering with the article in the meantime. The man who went in had a sort of "concealed principal" in the inspector. The Lord Chief Justice: I do not see how this inspector is "prejudiced;" he did not drink the whiskey. Mr. Wills: Then Section 13 is a dead letter; it abolishes the officer of health. The Lord Chief Justice; There are two classes of persons to prosecute—a member of the public, and the public analyst. Section 6 gives power to the purchaser to prosecute where an offence has been committed; and Section 13 gives power to the inspector to have it analysed; but it creates no offence. *I am of opinion* that this appeal must be dismissed. I should be very sorry indeed if in so holding I

thought I was doing anything to diminish the efficacy of a most useful Act of Parliament—useful, at all events, in this sense, and to this extent, that it is intended to prevent frauds being committed by the sellers of adulterated articles to the poorer classes of consumers, who have no means of ascertaining whether they really do get the article that ought to be supplied to them, and upon whom, independently of the protection that this Act gives, there is no doubt that very serious frauds were committed, which the Act to a great extent has been the means of preventing. Still, we must see that we do not unduly and unnecessarily interfere with the relation of seller and buyer to the prejudice of either, and I think we should be doing that if we extend the case in which both parties are perfectly aware of the terms on which they are dealing—if we were to extend to such cases provisions which were intended to apply only to clandestine fraudulent transactions on the part of the seller to the prejudice of the buyer. It seems to me that the true construction of Section 6 and the provisions which immediately follow it is this: that when a seller professes to sell a particular article, and he sells that article altered in some manner by the admixture of something else, it must be taken that he does it to the prejudice of the purchaser, unless the fact is duly and sufficiently brought to the knowledge of the purchaser; but if the alteration of the article by the admixture of something else, as the alteration of spirits by the admixture of water, is brought to the knowledge of the customer, and the customer chooses to deal on that footing and purchase accordingly, it never can have been intended that the dealing as carried on to the satisfaction of both parties should be interfered with. But, on the other hand, if the seller chooses to sell under the character of a given denomination of food, whether in the shape of drink, food, or drug, he chooses to sell the article with a certain admixture, it must be upon him—it is incumbent upon him—to prove that the purchaser knew what he was purchasing in respect of the quality of the article. The statute has provided him with means of insuring himself protection against the possibility of the presumption which otherwise presents itself operating to his prejudice; for the statute has expressly provided that if he in any way affixes or attaches to the thing which he sells a printed or written notice of the alteration which has been made in its quality, he then gets rid of the possibility of being charged with fraud within Section 6. If he does not have recourse to that, then, I think, it is incumbent upon him to prove that the presumption which otherwise would attach to the sale is in the particular instance unfounded. If he can show that he communicated, whether by this means or by that, that he brought home distinctly and expressly to the knowledge of the customer that the quality of the article had been affected by the admixture of some foreign ingredients, then he does not commit an offence within Section 6, because he does not sell the altered article to the prejudice of the purchaser. Both parties are left perfectly free to deal on that footing. Supposing that a man stuck over the bar where the spirit is sold, in clear and unmistakable terms, in words printed in sufficiently large capital letters, "The thing which I sell here is so many per cent. below proof," he would not, in my opinion, come within the 6th Section, although he might not affix the label to the gin or anything else which was sold, because it was not sold to the prejudice of the purchaser. The customer knows that he can get it cheaper by taking it in that way. I think, therefore, in the present instance there was no proof that the purchaser did not perfectly well know, or the man employed by the purchaser, that there was a notice in the bar and tap-room where spirits were sold that the spirits were not sold pure in quality. Mr. Wills says there may be some doubt about it, and that is the ground on which we are asked to show a favour to the respondent. I think in this matter, it being perfectly clear, beyond all possibility or dispute, that the appellant had in this instance stuck about in various parts, in a manner perfectly conspicuous to all customers, that he did not profess to sell spirits pure or up to proof, we will not send it back for the sake of the appellants, since in this particular instance we should be harassing the defendants unnecessarily, the man not having committed any offence against the statute. That being so, and as I think there is no offence within the meaning of the 6th Section, it seems unnecessary to consider whether the provisions of the statute as to the notice of the intended analysis being given, have been substantially complied with. Mr. Justice Mellor: I am of the same opinion. I should have been glad if the magistrates had specifically found the matter which Mr. Wills contends is rather to be inferred from what has taken place than not. They have not so done, and I agree generally in the construction of the section which has been put on it by my lord. I believe in a case where, under the circumstances that notice was given that gin or whiskey, or any spirit sold at that public-house were all of them mixed as the notice itself specified, not specifying the exact amount, but in large letters stating "all spirits sold here are mixed"—then, under sections 8 and 9, the notice is put opposite the bar window; and although it is said in the case that the man who bought the spirits "at the moment" did not see it, certainly I should infer that though he did not "at the moment" see it, it must have the meaning that at some decided moment he might not, but that he saw directly after, and before he paid the money, and before any notification could be given to the party of the intention to submit the matter to analysis. Then I think that it is not a case one would desire to send down again. The facts on any future occasion may be gone into more fully and more specifically, but in the way in which the magistrates have submitted it they seem to raise questions rather affecting a proviso than affecting the general section which raises the offence. Certainly with regard to that it may be a question. If this man intends to

protect himself absolutely, I think it would be a more prudent course, whatever the result of this case, that he should actually deliver a notification—a printed paper that it is so-and-so, and not to stick it on the bottle or post it up, but, in handing the article over to the purchaser, to deliver the notice. I don't wish to give any definite opinion on these points, because in my view it is unnecessary, for I agree with my lord that we are justified in coming to the conclusion that the offence was not actually committed. Under these circumstances, we ought not to send it down again, and, therefore, the appeal must be dismissed. The appeal was then dismissed, but without costs.

NOTES OF THE MONTH.

Our contemporary, the *Chemist and Druggist*, which of course was down on Mr. Allen in an article headed "*Analysm*," based mainly on the Selby flour case, now states that '*it was not its intention to impute malice to Mr. Allen, and it does not think the article will bear that construction.*' Of course not. Mr. Allen was not malicious, he only (we quote literally) "prided himself on the number of convictions he can secure," and there is "scarcely any business he has not taken in hand with the view of reforming." It is a comfort to think that the author had no occult intention in making such statements, but if there be not malice in the article we fail to understand the English language. We specially note that while the detraction (?) was published in a leading article, the apology is only printed as a paragraph at the end of Mr. Allen's letter. Thus a trade journal will try to take an analyst's character away, but has not the courage when fairly met to support its innuendos. If instead of always abusing public analysts the *Chemist and Druggist* would turn round on those undercutting (so-called) wholesale houses which imperil the honour of the honest retailer by selling him trash, after alluring him by low prices, it would be performing a real good to the trade it claims to represent. But, unfortunately, it is not the poor retailers that are the best advertisers; so how can a trade journal be expected to look after them when it can indulge in the more profitable —more congenial—and more sensational luxury, of stabbing in the back a class of men whose duties are difficult and whose position is irksome.

Talking about analysts leads to a curious reflection. According to the trade journals the analyst alone is responsible for all prosecutions, and nothing is said against the inspector who actually buys, or the local authority which institutes and carries on the prosecution. Would they, we wonder, give any sympathy to an analyst who in the exercise of that discretion which they always presume he possesses, advised his vestry that although a certain article was not exactly what it was supposed to be, yet they should not prosecute because a trade custom had long *consecrated* the sophistication? Would they also be prepared to find that the analyst received for his trouble a curt intimation that such remarks were not his business—the vestry alone would decide and that in future he was simply to state the composition of articles? If such a case had gone on and been dismissed, as it very likely would have been, would this have been another "incompetent analyst"?

Will some of our friends, such as the *Chemist and Druggist*, kindly advise how an analyst should act in such a case so as to escape abuse from either one side or the other, or from both afterwards?

Here is another curious reflection. Analytical chemists are at best only men, and *errare est humanum*. Suppose, then, an analyst gives a report which is a matter of

opinion, and on the *same results* the Somerset House chemists give a different opinion. Is not that a thing which happens every day in our law courts? Is there, therefore, a journal devoted to the abuse of vice-chancellors every time their decision is reversed on appeal? On the same principle why will not the *Chemist and Druggist* devote a column to racy innuendos against the judge who decided against their side in the prescribing druggist's case, supposing there should on appeal be a reversal in their favour. Surely what is sauce for the goose of an analyst, is also that for other ganders!

There is one thing, however, to be said in favour of the *Chemist and Druggist*, which is, that it makes no pretence of impartiality, or of being more than a good trade journal, giving the best of practical information, and were it not for its craze on the subject of analysts, it would be an excellent journal of its class. But, what shall be said of the *Pharmaceutical Journal*, supposed to be the impartial organ of a great society—setting itself up for a scientific print—edited by a person who is himself an analytical chemist,—and yet lending itself to a system of traduction. In it we have articles directed to cast aspersions on analysts holding *public* appointments, and under that guise of science and impartiality, secretly bolstering up adulteration. A very fine specimen of the method of throwing discredit on his *confrères* was exhibited in a leaderette as to selling decomposed *spirits of nitre*. How would the editor like us to hint in the same manner that his certificate of analysis would, if tested in court, be found wanting? Such writing may be racy, but it is decidedly unprofessional.

A discussion has, it seems, been going on in New York as to the desirability of the so-called butterine or oleomargarine as an article of food, and we have read a report, accompanied by analysis, stated to have come from the "Department of Agriculture at Washington" upon its properties. We are not aware who the eminent gentleman was in whose hands the sample was placed, but his competence to deal with the subject may be judged by the following extract from his report. He says—"the composition of the material shows no marked deviation from that of ordinary butter as found in the market, and there is no evidence of the presence of anything injurious or abnormal." The analysis on which this statement is founded reports the estimation of the total fat, casein, salt, sugar (?) and water. As, therefore, no attempt has been made to look into the character of the fat by the estimation of the fatty acids, it is not astonishing that nothing abnormal was found. The best of the joke is, however, yet to come, as the analyst then proceeds to say—"I also give below an analysis of butter found upon record, *not having had time to complete one myself as yet (!)* After this statement it is not astonishing to find that the so-called analysis of the butter is also based upon the same lines. In conclusion, this authority says, when comparing butter and oleomargarine—"by these it will be seen that while the constituent parts are identical, there is a considerable variation as to quantities, especially as regards water and salt." We trust that American chemists are not generally so far behind the age.

On the other hand we have a statement in the American *Dairyman* in which the writer shows a great distinction between the two articles, and urges upon the attention of those interested, the important fact, that the butterine may become the carrier of morbid secretions, germs of disease, and embryos of parasites; especially when pork fat is

employed. He bases this warning on the fact that owing to the low temperature at which the fat is melted it is virtually raw. To this the manufacturers answer that no pig's fat is ever used. As far as we see the truth lies somewhere between the two statements. That butterine is identical with butter in composition is simply nonsense; but that it is an agreeable and as a rule harmless form of preparing fat for consumption must be admitted, and there would be no objection to it if provision dealers would only be honest and cease to sell it as butter.

We have often pointed out the effects of locality on adulteration, but this month we have another unique illustration. Two persons are summoned for selling butterine as butter. One defendant alleged that she bought it as butter, so she was mulcted £5. The other defendant knew that it was butterine, although he sold it as butter, and he had only five shillings to pay. Therefore the greater offender has the least penalty, and Portobello is better protected than Liverpool.

RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1877. No.	Name of Patentee.	Title of Patent.	Price.
4286	J. H. Kidd	Treating Refuse and Sewage to obtain Manure	6d.
4359	W. L. Wise	Disoxygenising Atmospheric Air	6d.
4465	R. Rawlinson... ...	Treating Bone	2d.
4491	F. M. Lyte	Manufacture of White Lead	4d.
4542	P. Jensen	Isinglass, Gelatine and Glue	2d.
4558	A. M. Clark	Hydraulic Limes and Cements	4d.
4420	J. F. G. Kromschröder	Carburetting and Purifying Coal Gas	6d.
4453	R. Taylor	Cleaning Tin or Terne Plates, &c.	6d.
4580	M. K. G. Lieber ...	Manufacture of Soda and Potash, &c.	2d.
4618	H. B. Condy.. ...	Treatment of Aluminous Earth	4d.
4638	L. T. Froideville and H. Taponier	Anti-calcareous Composition for preventing incrustation in Steam Boilers	2d.
4642	R. Werdermann ...	Phosphoretted Iron	2d.
4671	J. H. Jonson ...	Production of Saccharate of Lime	2d.
4672	J. H. Jonson ...	Purification and Treatment of Saccharate of Lime	4d.
4769	C. D. Abel	Treatment of Hydro-carbons	4d.
4479	P. Aube	Manufacture of Gas	6d.
4682	H. H. Murdoch ...	Manufacture and Refining of Sugar...	6d.
4717	A. Jay	Mixture for preventing incrustation in Boilers	2d.
4732	R. Calme	Blasting Powder	4d.
7765	J. W. Swan and B. S. Proctor	Purification of Opium	4d.
1878. 314	W. V. Wilson ...	Manufacture of Cyanogen products from Gas residues	2d.

SOCIETY OF PUBLIC ANALYSTS.

The next meeting will take place at Dublin, during the meeting of the British Association, and will be held at the Royal College of Surgeons, Stephen's Green.

BOOKS, &c., RECEIVED.

Aids to Chemistry; Phosphates in Nutrition, Anderson; Payne's Industrial Chemistry, Paul; The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Medical Record; The Miller; The Anti-Adulteration Review; Journal of Applied Science; The Country Brewers' Gazette; The Dairyman; The American Dairyman; The Practitioner.

Errata.—Analyst for July, page 290, line 8; for 1·82, read ·162.

THE ANALYST.

SEPTEMBER, 1878.

SOCIETY OF PUBLIC ANALYSTS.

A General Meeting was held on the 19th August last, at the Royal College of Surgeons, Dublin, Dr. Wallace, F.R.S.E. in the chair and Dr. Cameron acted as Secretary.

The minutes of the previous meeting were read and confirmed.

Messrs. Estcourt and Stewart were appointed scrutineers to examine the ballot papers and reported that Messrs. R. Mc Alley, of Falkirk; Thomas Woods, of Parsonstown; H. Leicester Greville, of London; W. Mc Cowan, of Greenock; and A. Ashby, of Grantham were duly elected members.

Dr. Cameron read a paper "On the Inconstant Composition of Well-waters," and Dr. Wallace, Mr. Allen, Mr. Estcourt, Mr. Stewart, and Mr. Braham joined in the discussion which ensued.

Dr. Cameron also read a paper "On the Solubility of Plumbic Iodate."

Mr. Estcourt read some "Notes upon the desirability of fixing by analysis some standards of value for beer based upon the qualities usually sold in large towns," on which Dr. Cameron, Mr. Braham, and Mr. Allen made some remarks.

Mr. Allen read a paper "On the distinctive tests for Carbolic Acid, Cresylic Acid and Creasote," on which a general discussion took place.

Mr. Wigner's third paper "On the Nitrogen Compounds present in the Cereals," was postponed owing to his indisposition.

ON THE DISTINCTIVE TESTS FOR CARBOLIC ACID, CRESYLIC ACID AND CREASOTE.

By Alfred H. Allen.

Read before the Society of Public Analysts, at Dublin, on 19th August, 1878.

Several observers have devised methods for distinguishing carbolic acid from wood-tar creasote, and have described tests which, when applied to the pure substances, leave little to be desired.

It appears, however, not to have been observed that cresylic acid, so largely present in the commoner kinds of carbolic acid, resembles creasote more closely than pure carbolic acid does, and fails altogether to respond to some of the tests which have been proposed for distinguishing carbolic acid from creasote. As any substitution of the coal-tar acid for wood-tar creasote is pretty certain to be made by the employment of a crude variety of carbolic acid, the presence in the latter of cresylic acid cannot rightly be ignored.

With a view of clearing up the discrepancies between the results recorded by other observers, and of ascertaining the most desirable tests for distinguishing carbolic and cresylic acids from wood-tar creasote, I have instituted a series of special experiments.

As the origin of some of the statements made by other observers cannot be traced,

owing to imperfect descriptions of the substances on which they worked, I think it well to define carefully the exact substances on which my own experiments were made.

The *Carbolic Acid* was a sample of Calvert's No. 1, for internal use; boiling point, 182° C.

The *Cresylic Acid* I prepared by fractional distillation of Calvert's No. 5 carbolic acid. The portion coming over between 195° and 205° C was collected separately, and again distilled, the first and last portions being rejected. The cresylic acid thus obtained, boiled chiefly at about 197° C, but another smaller fraction boiled at 203°. C. I believe this difference is due to the presence of two isomeric creasols in coal-tar, having slightly different boiling points. Many of the experiments were made separately on both fractions, but without the least further distinction in their properties becoming apparent. The distillations were conducted in an atmosphere of coal-gas.

The *Creasote* was a sample of Morson's wood-tar creasote. It boiled at 217° C, and so probably consisted chiefly of creasol ($C_8H_{10}O_2$,) as guaiacol boils at 200° C.*

It was pointed out by Calvert many years ago, that carbolic acid forms a crystalline hydrate of the composition C_6H_6O, H_2O, which fuses at 17° C. This fact is usually ignored by the book-makers, though well known to carbolic acid manufacturers. This hydrate would contain 16·07 per cent. of water. When water is gradually added to carbolic acid with repeated shaking, the crystals become liquified and at length a portion of the water remains at the surface.

In order to ascertain how much water carbolic acid would take up, a quantity of about 10 grammes of the crystallized acid was melted and boiled for a minute or two in a small weighed test tube to drive off traces of water. After cooling, it was weighed. Cold water was then added gradually, with repeated shaking, until about ·2 c.c. remained as a layer on the surface of the liquified acid. This was then removed by cautious use of wet blotting-paper, and the residual carbolic acid was weighed. 9·190 grammes were found to have increased to 12·527, which gives 26·6 per cent. as the proportion of water in the liquid acid. On repeating the experiment, a liquid acid containing 27·0 per cent. of water was obtained. This fact is of importance, as showing that carbolic acid will take up far more water than is commonly supposed. The proportion is also of interest, as it corresponds pretty closely with the formula $C_6H_6O, 2H_2O$.† Hence the liquid acid may be regarded a definite hydrate of phenol, but the fact that warm carbolic acid will take up a larger proportion of water than the above, and that the water is entirely separated by agitation with benzol, is against this supposition.

On trying a similar experiment with cresylic acid, I found that the water absorbed amounted to 13 per cent. of the hydrated acid. On repetition, the product contained 14 per cent.

C_7H_8O, H_2O requires 12·7 per cent. of water.

In the subsequent experiments, when mention is made of hydrous carbolic or cresylic acid, the products obtained as above are to be understood.

1. *Action of Cold.*—Absolute carbolic acid is solid at ordinary temperatures, and the hydrous substance solidifies in a freezing mixture of hydrochloric acid and crystallized sulphate of sodium. Neither absolute nor hydrous cresylic acid, nor creasote, shews any signs of freezing on exposure to the same degree of cold.

* According to some observers at 210° C.

† The theoretical proportion of water in this compound would be 27·69 per cent.

2. *Solubility in Water.*—20 c.c. of water at about 17° C dissolves 1·8 c.c. of hydrous carbolic acid. This corresponds to a solubility of 1 volume in 11·1 of water. Hence the saturated aqueous solution contains 8·56 per cent. by weight of the absolute acid, corresponding to a solubility of 1 part by weight of absolute acid in 10·7 parts of water. This is a far greater solubility than is generally attributed to carbolic acid, the discrepancy being probably due to an impure acid being generally used. In hot water carbolic acid is still more soluble.

Hydrous cresylic acid dissolves in about 29 measures of water at about 20° C, which represents a solubility of 1 part by weight of absolute cresylic acid in about 31 parts of water.

3. *Solubility at* 15·5° *C (=60° F) in Solution of Caustic Soda containing* 6 *per cent. of* $NaHO$*.—Absolute carbolic acid is completely soluble in an equal volume of soda solution containing 6 per cent. of pure NaHO (free from alumina); addition of more of the alkaline solution up to 6 volumes causes no change, the liquid remaining perfectly clear.

Absolute cresylic acid is insoluble in small proportions of 6 per cent. soda solution. When a large excess (9 volumes) is added, it disappears and forms distinct crystals.

Creasote is practically insoluble in 6 per cent. soda.

4. *Solubility at* 15·5° *C in Solution of Caustic Soda containing* 9 *per cent. of* $NaHO$*. Absolute carbolic acid is soluble in an equal measure of 9 per cent. soda. On addition of any proportion of water up to 7 volumes the liquid remains clear, but is precipitated by 8 volumes of water. Carbolic acid is also soluble in two measures of 9 per cent. soda, and is not precipitated by less excess of the reagent than 5 or 6 measures.

Absolute cresylic acid is soluble in an equal measure of 9 per cent. soda, but is precipitated when the proportion of the reagent is increased to 3½ volumes. If to a clear mixture of equal volumes of cresylic acid and 9 per cent. soda, a few drops of water be added, precipitation occurs, and when the proportion of water is increased to one volume the original bulk of cresylic acid separates out. Hence, cresylic acid is insoluble in two measures of 4½ per cent. soda solution.

Creasote is insoluble in any smaller quantity than two volumes of 9 per cent. soda. It is partially reprecipitated when the proportion of the solvent is increased to more than 3½ measures.

5. *Solubility at* 15·5° *C in Solution of Ammonia* (sp. gr. ·880.) Absolute carbolic acid is completely and readily soluble in an equal volume of strong ammonia. The solution is not precipitated by addition of less than 1½ volumes of water. A mixture of 1 part of carbolic and 3 of cresylic acid is soluble in an equal measure of ammonia, but the solution is precipitated on adding even a few drops of water.

Cresylic acid is almost insoluble in ammonia, requiring upwards of 16 volumes for solution, and then forming crystalline scales similar to those obtained by the use of soda.

Creasote is practically insoluble in ammonia, requiring 60 to 80 volumes for solution.

6. *Behaviour with Benzol.*—Absolute carbolic and cresylic acids and creasote are miscible with benzol in all proportions. The hydrous substances dissolve in 5 volumes of benzol with complete separation of the water. Hence benzol may be used for the determination of the proportion of water present in samples of carbolic and cresylic acid.

* These solutions contained respectively 94 and 91 grammes of water to each 6 and 9 grammes of pure caustic soda.

7. *With Chloroform, Carbon Disulphide, or Ether.*—Carbolic acid, cresylic acid, and creasote, react in much the same manner as with benzol. Agitation with 9 per cent. soda removes them from their solutions in the above solvents.

8. *Behaviour with Petroleum Spirit of sp. gr.* ·699 (commercial "benzoline.") Absolute carbolic acid dissolves half its volume of petroleum spirit, forming a clear liquid. On addition of a larger proportion of petroleum spirit precipitation occurs. With one volume of carbolic acid and three of petroleum spirit, the layers have about the same measures as the original liquid. Each layer however contains both liquids, as may be proved by cooling the tube with a freezing mixture (or by wrapping filter paper round it, and dropping CS_2 on the outside) when carbolic acid crystallizes out. Absolute carbolic acid is permanently soluble in about ten measures of petroleum spirit at 15.5°C (=60°F) The solubility is enormously increased by rise of temperature. Hence carbolic acid and *hot* petroleum spirit are miscible in all proportions; on the other hand, by cooling with a freezing mixture, the carbolic acid is almost wholly deposited. If the cooling occurs slowly, it forms a heavy liquid layer with a portion of the petroleum spirit, but by rapid cooling, the carbolic acid is deposited in long crystalline needles, which render the liquid semi-solid.*

Hydrous carbolic acid is almost insoluble in moderate quantities of cold petroleum spirit, which does not separate the contained water from it. (Another difference between benzol and petroleum spirit.)

Absolute cresylic acid appears to be miscible with petroleum spirit in all proportions. No separation, either of crystals or liquid, occurs by exposing a solution of one measure of the acid in three of petroleum spirit to a freezing mixture.

When hydrous cresylic acid is treated with cold petroleum spirit, the volume of the former increases somewhat by dissolving a little of the spirit, but on addition of a greater volume of pretroleum spirit it undergoes slight solution. It is only very sparingly soluble in petroleum spirit, requiring upwards of twenty volumes for complete solution, when the water separates. Creasote is miscible with petroleum spirit in all proportions.

9. *Behaviour with Glycerine of* 1.258 *sp. gravity.*—Absolute carbolic acid is miscible with Price's glycerine in all proportions. A mixture of one volume of carbolic acid with one of glycerine is not precipitated by an addition of three volumes of water. In presence of 25 per cent. of cresylic acid, precipitation occurs on adding more than two volumes of water.

Absolute cresylic acid is miscible with Price's glycerine in all proportions. A mixture of one volume of glycerine and one of cresylic acid is completely precipitated by one volume of water. Creasote is insoluble in Price's glycerine, whether the latter be added in the proportion of one, two, or three volumes for one of creasote.

The sample of Price's glycerine used for the above experiments was found to have a density of 1·258.

10. *Behaviour with Collodion.*—Absolute carbolic or cresylic acid when shaken with half its measure of *Collodium B. P.* precipitates the nitro-cellulose in a transparent gelatinous form very difficult to see. It is best observed by inclining the tube and causing the

* Crystallized carbolic acid may be used for distinguishing between coal-tar, benzol and petroleum spirit. In the latter it is sparingly soluble, and is re-deposited in a crystalline state by rapid cooling. With benzol it is miscible in all proportions (the crystals of carbolic acid rapidly melting), and a solution of one measure in three deposits no crystals by rapid cooling.

liquid to flow gently from one end to the other. Creasote does not precipitate the nitro-cellulose from collodion, but mixes perfectly with its etherial solution. Addition of much creasote to a mixture of collodion and carbolic or cresylic acid, causes the re-solution of the precipitated nitro-cellulose.

11. *Reaction with Ferric Chloride.*—The addition of one drop of a ten per cent. aqueous solution of ferric chloride to 15c.c. of an aqueous solution of cresylic or carbolic acid, causes a permanent violet-blue coloration. When creasote is similarly tested, a blue colour results, which almost instantly changes to green and brownish-yellow.

Other distinctive tests for creasote and carbolic acid are to be found in the books, but are almost worthless in practice. Thus the reactions with bromine, sulphuric acid, and nitric acid, are far too much alike to be of service for distinguishing between these bodies. It has been stated that creasote differs from carbolic in its power of rotating a ray of polarized light. I redistilled a sample of Morson's creasote to obtain it colourless, and carefully tried this test, expecting to find in it a possible means of determining the creasote in a mixture, but the rotatory power of creasote proved so exceedingly weak as to be quite worthless for the intended purpose, or even as a qualitative test. It is, however, quite possible that different samples of creasote may exhibit considerable differences in this respect, but if so, the test is valueless for quantitative purposes, and the problem is not so much to detect wood-tar creasote as to recognise an admixture of the coal-tar acids. I am also unable to confirm the statement that creasote gives a solid deposit when kept for some hours at the temperature of boiling water. I have not obtained satisfactory results by the reaction of an alkaline solution of the substances with hydrochloric acid and pine-wood, or with a solution of iodine in iodide of potassium.

From the foregoing details it will be seen that in various manners carbolic acid, cresylic acid and wood-tar creasote can be readily distinguished from each other. The case, however, is very different when we have to deal with a mixture of the three substances, such as occurs in the case of a sample of creasote adulterated with crude carbolic acid. In such a case many of the tests are greatly reduced in value or rendered absolutely worthless. As the problem is to detect the coal-tar acids in presence of wood-tar creasote rather than the reverse, only affirmative tests for the former bodies are of service, and in many cases these are seriously modified by the simultaneous presence of creasote. Thus, as has been pointed out by Mr. J. Williams, the ferric chloride test entirely fails to detect the presence of carbolic acid in a mixture of equal parts of that substance and creasote. The only marked differences I have been able to observe between Morson's creasote and a mixture of equal measures of that liquid and Calvert's No. 5 carbolic acid, are the following:—

4. When shaken with twice its bulk of 9 per cent. soda solution pure creasote was dissolved, and remained in solution when the solvent was increased to three volumes. The *mixture* was insoluble either in two, three or four times its volume of 9 per cent. soda. This anomalous result proved to be due to the presence of water, which reduced the strength of the soda solution. When the water was previously expelled by boiling the mixture of crude carbolic acid and creasote, solution took place with two volumes of soda.

9. When shaken with Price's glycerine (sp. gr. 1·258) pure creasote remained undissolved, though the proportion of glycerine was varied from one to three volumes. The mixed creasote dissolved completely and readily in an equal measure of glycerine.

The liquid was not affected by a drop or two of water, but a further addition caused precipitation. A mixture containing 25 per cent. of creasote, when shaken with an equal measure of glycerine, was not precipitated by less than one and a quarter volumes of water.

10. Shaken with half its volume of collodium (B.P.) pure creasote dissolved to a clear liquid. The mixed creasote showed decided signs of precipitation when the liquid was allowed to run gently from one end of the tube to the other. With a mixture of two volumes of Calvert's No. 5 acid to one of creasote, the precipitation of the nitro-cellulose was very marked.

As carbolic acid, cresylic acid, and creasote boil at temperatures tolerably widely apart, I thought it might be possible to effect a sufficient separation by fractional distillation, to enable the test for the coal-tar acid to be more readily applied. For this purpose I introduced a mixture of No. 5 carbolic acid and Morson's creasote into a small retort and distilled the liquid. The water, which came over first, was collected separately. The next portion of the distillate (amounting to about one-fifth of the whole bulk of the liquid) was boiled to free it from a little water, and was then tested with glycerine and with collodion. It dissolved readily in the glycerine, and precipitated half its volume of collodion. Hence the carbolic acid of the mixed creasote was fairly detected, and there seems no reason why fractional distillation should not serve for the detection of smaller proportions of carbolic acid, as it will certainly be most abundant in the first portion of the distillate. The ferric chloride test was not found of service for testing the distillate, sufficient creasote being present to produce a decided brown coloration.

As the tests with glycerine and collodion are the only reactions of service with mixtures of carbolic acid and creasote, I did not think it necessary to apply the other tests to the distillate.

It will be seen from my experiments that the high value usually attached to the glycerine test is amply justified. It has been stated that pure creasote was soluble in anhydrous glycerine. This is certainly not my experience, but if it be true that some varieties of creasote dissolve in absolute glycerine, they will doubtless be precipitated by the least dilution, and can thus be distinguished from mixtures containing considerable proportions of the coal tar acids.

Mr. J. Williams examined a sample of German creasote which was supposed to be pure and which dissolved in glycerine, but the fact that 40 per cent. of the sample distilled at 200° to 203°C., together with other characters, render it very probable that it contained an unacknowledged mixture of the coal-tar acids. It must not be forgotten that cresylic acid is much cheaper than carbolic acid, and is far more difficult to distinguish from creasote even when unmixed with the last substance.

I have thought it best to place my results on record in the fullest possible detail, as it is just the omission to do this that has caused so many confusing and incorrect statements to appear in our test books. The tests described are remarkably liable to failure when the conditions are slightly varied. This is notably the case with the reactions with solutions of soda, a change of a temperature or strength of the solvent causing extraordinary variations in the results.

Many of the experiments described in this paper were made under my direction by *Mr. L. Archbutt*, to whose perseverance and accurate observation I am much indebted.

NOTES UPON THE DESIRABILITY OF FIXING BY ANALYSIS SOME STANDARDS OF VALUE FOR BEER BASED UPON THE QUALITIES USUALLY SOLD IN LARGE TOWNS.

By Charles Estcourt, F.C.S.

Read before the Society of Public Analysts at Dublin, 19th August, 1878.

That some definite standards both of strength and composition should be recognised for beer sold in the ordinary manner by retail, is I think, not only simply desirable, but absolutely necessary. A few considerations will convince us it is also possible.

In order to show that it is desirable I will describe the state of things as existing in Manchester, which may be taken as a fair example of a large town. Some months ago I received several samples of beer, which in due course, I analysed. I subsequently ascertained what price had been paid in each case, and found, to my great astonishment, that even in a large town like Manchester, the public obtained at the various places, widely different value for their money. I have estimated the value of these beers, taking as a basis the amount the Government would allow as draw-back if each brewer were to export instead of selling in the home market. This drawback or allowance on export, as you will probably be aware, is based upon the assumption that each degree of original gravity of the beer indicates a given quantity of saccharine matter used by the brewer. Well, I found that while one part of Manchester got excellent value for its money in the shape of beer, deserving of a drawback of 71½-pence, other parts of the same town had to be content with beers worth varying amounts, down to the lowest at 45½-pence. I give with this a table of details resulting from analyses of these beers, and it will be observed that not only does the original gravity of each differ, but the amount of alcohol in these beers varies considerably, the most costly beer not having by any means the highest amount of alcohol. This I need not say disposes of the rather original method devised by some gentleman for ascertaining from the amount of alcohol present how much water had been added to finished beer. A beer brewed from a very much smaller quantity of malt, say than Bass's pale ale, can by fermentation be made to contain much more alcohol than is found in Bass's.

As only three qualities of beer are recognised by the general public in the large towns in England, I would suggest that it would be quite possible without seriously restricting the freedom of trade, to enact that these three qualities should be (within certain limits) of certain definite original gravities, and as they are already well-known by the prices at which they are sold, I submit that the possibility of the course I propose is self-evident.

In looking over the table appended to this, which table will I hope show the *raison d' être* of the title of this short paper, I wish particularly to direct attention to some apparent discrepancies in the total mineral matter other than sodium chloride, which was found per gallon. Thus, although the mineral matter in some cases decreases or increases in quantity as the beer is of a lower or a higher gravity, still this rule does not hold good, and it is found that a beer having an original gravity of 1066·4 has more mineral matter per gallon (excluding NaCl) than the beer of 1069·0 original gravity. This serious irregularity prevents our estimating the value of a beer, or its freedom from added water by the ash alone. As no doubt the members of the Society are aware the use of sugar is permitted in brewing, and it is to the use of varying quantities of sugar

with the malt in brewing, that these irregularities in the quantity of mineral matter in a beer are due. However, a low ash is fairly good evidence that a beer is not entirely made from malt. I have tried several methods for making an accurate determination of the value of a beer by analyses.

The data required are:—The original gravity, (which also gives in the specific gravity of the extract, the percentage of solid matter); the total ash; the sodium chloride; the phosphoric acid; and the ammonia produced when the beer is Wanklynized. This method of estimating the nitrogenous compounds in solution in the finished beer was used by me some two years ago, and was used simultaneously by several scientific brewers. The results obtained I have not published for two reasons, the main one being that I did not obtain permission from the brewers at Burton to publish my results, and the other is that my results were in many points necessarily incomplete. However, the phosphoric acid found and the ammonia produced by Wanklynising will fairly indicate the malt used, and the ash will indicate within certain limits the amount of sugar used. In any beer analysis it is obvious that a knowledge of the water used in brewing is absolutely necessary.

Regarding the use of bitters other than hops, I may, as I have already done, point out that the Government specifically refused, when asked three years ago, to define beer as malt and hops. To obtain such a change it is necessary that not only the public analyst but the general public should work, and then, and not till then, will a satisfactory result be arrived at. I must apologise for the incompleteness of this paper, and hope, before long, to forward the results of a series of analyses of genuine malt worts made into finished beers.

No.	Gravities of			Acetic Acid per cent.	Grains per Gallon.			Alcohol.			Original Gravity.	Real Value expressed by amount of Duty paid in pence.
	Beer.	Distillate.	Extract.		Total Mineral Matter.	Mineral Matter other than salt.	Salt.	By Weight per cent.	By Volume per cent.	Percentage of Proof Spirit.		
1	1009·6	991·21	1018·1	0·18	364·8	254·8	110·0	5·00	6·22	10 97	1056·8	d. 71·25
2	1008·2	991·60	1016·5	0·16	197·0	185·0	12·2	4·76	5·92	10·42	1053·0	d. 66·5
3	1007·1	991·33	1015·6	0·15	233·0	214·5	18·5	4·92	6·14	10·80	1053·4	d. 66·4
4	1007·9	991·68	1016·0	0·13	179·5	173·0	6·6	4·71	5·85	10·32	1051·7	d. 64·8
5	1004·6	991·82	1012·3	0·17	200·2	172·6	27·6	4·62	5·76	10·14	1047·6	d. 59·9
6	1005·2	992·03	1013·0	0·15	219 1	194.5	24·6	4·50	5·61	9·86	1047·0	d. 59·2
7	1009·7	994·80	1014·8	0·17	203·0	131·0	72·0	2·80	3·56	6·25	1035·76	d. 45·5
8	1005·0	990·72	1014·0	0·18	233·0	184·4	48·6	5·31	6·61	11·62	1055·22	d. 69·2

Percentage of extractive matter excluding the ash. By Balling's tables with correction as applied by Thudichum and Dupré in wine analysis.

1.	2.	3.	4.	5.	6.	7.	8.
3·667.	3·631.	3·300.	3·552.	2·541.	2·666.	3·175	2·883.

REVIEW.

PHOSPHATES IN NUTRITION.*

Although the review of strictly medical books is a matter outside our province, yet, when, as in the present case, we find an author honestly trying to apply the researches of analytical chemistry to the treatment of disease, it is a matter that strikes us as interesting to our readers.

* *Phosphates in Nutrition, and the Mineral Theory of Consumption and the Allied Diseases*, by M. F. Anderson, *L.R.C.P., Ed.*, and M.R.C.S., Eng. London: Baillière, Tindall & Cox. 1878.

Mr. Anderson's intentions and views as to the close relations of chemistry to medical science will be best seen by quoting his opening statements, in which he says:— "Chemistry has at all times, since men began to have any idea of this science, been of "material help in the treatment of disease.

"In the days of the old alchemists absurd expectations were held as to its future "probable influence on life, as the phenomena and changes wrought under their hands "were noticed, ideas were entertained that it would furnish means for prolonging or "perpetuating life in eternal youth, by the discovery of some new agent which would "arrest decay.

"To this imaginary substance the term vital principle was applied, and men spent "their lives searching after the phantom. Now that a knowledge of the laws of "chemistry and its sister science physiology, has taught us the fallacy of such views, we "can pity the misdirected energy of these old students in their endeavours to discover "that which, according to the laws of nature, could not exist. Our pity should, however, "be mingled with gratitude, for acting as the pioneers in a science which has conferred "great benefits on mankind, that have not yet reached their limit, as every year is "adding to our store of utility in its application. Although powerless to provide us "with perpetual youth, or prolong life beyond the allotted time by the means originally "sought after, chemistry may yet be made to minister in many ways towards the main- "tenance of life, by lessening, remedying, or preventing disease, so that in course of "time the old expectations formed as to its power may be to some extent realised.

"That up to the present time, chemistry has only acted an humble part in the "investigations as to the cause and treatment of disease, is readily explained by the fact "that hitherto analytical chemistry has been acquired only by a few, who, as a rule, "pursued their work in a direction apart or distinct from physiology. Now that "chemistry is more generally taken up by the medical profession, and as more attention "is paid to quantitative analysis, and new and more perfect methods of analysis are "introduced, results will be obtained which in the past have been unattainable.

"Recent examinations of the inorganic materials in the soft tissues, and their "relative quantities, have led me to conclude that these substances exert a very important "influence in nutrition; and their absence or presence in insufficient quantities, either "from diminished supply or imperfect assimilation, is the origin of a class of disease "(organic) which have hitherto received no explanation as to cause.

"That my views, involving as they do doctrines entirely new, and carrying so "large an issue as the curability of organic diseases, will be at once generally accepted, "is more than I can expect; but I am willing to trust to time and to practical results in "treatment to test their truth. Up to the present time treatment based on the conclusions "arrived at has in my hands met with remarkable success."

The author then proceeds to consider the inorganic constitution of the various tissues of the body, the blood, and also nerve and brain matter. He illustrates his views by a large number of analyses, and shows that in all cases (except in the brain and nerves, which contain a slight excess of phosphoric acid), the mineral constituents are in such proportion as to form true tribasic phosphates—such compounds he regards as *tissue phosphates*, and gives *inter alia* the following examples:

Theoretical tissue phosphate, by his theory, should show in one gramme of mineral residue—

Lime	·214
Magnesia	·074
Potash	·208
Phosphoric Acid	·338
Total Tissue Phosphate	·834
Sodium, Chloride, &c.	·166
	1·000

Actual experiment gave him—

Lime	·214
Magnesia	·074
Potash	·208
Phosphoric Acid	·332
Total Tissue Phosphate	·828
Sodium, Chloride, &c.	·166
	·994
Loss on Phosphoric Acid	·006
	1·000

So that his actual analysis comes within ·006 of his theory, that the phosphoric acid of the tissues is thus combined.

Passing on to the contrast of the comparative effects of actual starvation and wasting disease, the author asserts that while in the former the tissue phosphates do not decrease, in the latter the falling off is very marked. This is a point worth noting by chemists engaged in medico-legal investigations. He says:—

"The external appearances and general condition of a body, when death has occurred "from starvation, are so like those presented in cases of tubercular disease, as to afford "an opportunity of adducing conflicting medical testimony in favour of one or other view "as to cause of death. In the late Penge case, for instance, analytical examination of "the tissues, and of their mineral constituents, would have materially helped in arriving "at an opinion as to which of the two conditions caused death. In starvation the "mineral constituents of tissue phosphate would not be materially lessened—from wasting "of the tissues, caused by the combustion of their organic matter, there would be an "apparent increase in the percentage of mineral matter. On the other hand, in tubercular "disease there would be a material decrease in the mineral matter as compared with the "general wasting."

Coming to the actual treatment of disease, the author refers to the use of the hypophosphites, but argues that if any mineral food is supplied at all, the full constituents of the tissue phosphate must be contained in it. He says:—

"From its chemical composition any hypophosphite can only partially be useful, if "we allow that hypophosphorous acid is, at the right time and in the right way, con- "verted into the requisite phosphoric acid—by no means a proven fact—a large "proportion of the necessary bases must be deficient. My ideas of treatment extend "beyond this; and I propose, by supplying all the mineral ingredients of nutrition, to "leave nothing to chance; so that if there be a fair amount of assimilation, all the "mineral elements for tissue fabrication, or renewal, may be present. The farmer who "calls in the aid of chemistry to enable him to ascertain the deficiencies of his soil for "any particular crop, does not, if he expects good results, limit himself to supplying only "a portion of the ingredients wanted. He takes care that the manure he uses contains "all the mineral matter indicated to be wanted; if he neglects to do this, his success can "be but partial, and his crops will fall short for want of some one essential for their "growth. The same rules apply to the growth and development of animal life as apply "to the vegetable kingdom, as far as the necessity of certain chemical compounds for "their respective growth and development is concerned.

"Without certain mineral constituents no plant can thrive, and without certain "mineral matter no animal can live in health, the requirements of both are fixed and "definite, and chemistry can be used to point out their character and quantity."

On the whole, without venturing to discuss the medical conclusions, we must say that the chemical investigations are both interesting and valuable. The book is the result, not only of much thought, but of continued practical work in the laboratory, and is very interesting reading from beginning to end.

DISTILLATION OF CASTOR OIL, UNDER REDUCED PRESSURE.

By F. Krafft.

From *The Pharmaceutical Journal.*

When castor oil is distilled under a very low pressure, there passes over first a colourless oily distillate, equal to about one-third or one-half of the oil used, and then a small quantity of an oily liquid, whilst a slimy saponifiable mass remains in the retort. Half of the oily distillate consists of œnanthol, which is separated by distillation; after the œnanthol has distilled over, the temperature suddenly rises above 100°, and then remains stationery. The distillate which now comes over solidifies to a crystalline mass, the analysis of which led to the formula, $C_{11}H_{20}O_2$; this melts at 24·5°, and boils at 198-200° under a pressure of 90 mm.

It appears to be a new member of the oleic series, forming a crystalline barium salt; on fusing with potash it gives acetic and nonylic acids; with bromine it forms a crystalline addition product, melting at 38°. The following equation represents the formation of œnanthol, and of the new acid from ricinoleic acid:

$$C_{18}H_{34}O_3 = C_7H_{14}O + C_{11}H_{20}O_2.$$

The remainder of the distillate obtained from the castor oil distilled under the above pressure chiefly at 250-265°, but has not yet been investigated.

HOUSE OF COMMONS.

July 30th, 1878.

Sale of Food and Drugs' Act Amendment Bill.

In Committee on this Bill,

Mr. Saul Isaac moved an amendment, the object of which was to sanction the sale of spirits reduced by water, regard being had not only to the extent of such admixture, but also to the price at which the spirits so reduced are sold.

The amendment was opposed by Mr. Monk and Mr. Courtney, but supported on behalf of the Government by Mr. Sclater-Booth, and carried by a majority of 29 to 8.

The Bill then passed through Committee.

The Bill was subsequently withdrawn by Mr. Anderson, who we believe intends to re-introduce it next session.

ANALYSTS' REPORTS.

Mr. Estcourt, Public Analyst for the City of Manchester, in his quarterly report submitted to the City Council, lately said he had made analyses with the following results:—Ten samples of beer, all genuine; 11 samples of milk, 1 adulterated with water to the extent of 10 per cent. and skimmed to the extent of 30 per cent., and 1 adulterated with water to the extent of 9 per cent. and skimmed to the extent of 50 per cent.; 1 sample of sweets, which was genuine; 1 of preserves, genuine; 2 of bread, genuine; 4 of arrowroot, genuine; 5 of coffee, 1 adulterated with 25 per cent. of chicory; 1 of cream of tartar, genuine; and 1 of magnesia, genuine.

Mr. Ralph Betley, borough analyst, has presented his quarterly report to the Wigan Town Council, in which he says: "During the past quarter I have examined 7 food and drink samples—viz., 1 of bread, 2 of milk, 2 of beer, and 2 of spirits. All were of good quality."

Mr. Cornelius O'Keeffe, Public Analyst, has been appointed by the Committee of Merchants to the office of Analyst to the Cork Butter Exchange, his duties being from time to time to take samples of the butter brought into the market and report thereon.—*Grocer.*

CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

MILK ADULTERATION.

To the Editor of "The Analyst."

Sir,—As at the adjourned hearing of the milk case, held before the Bath magistrates, on the 12th inst., the worthy chairman expressed the inability of the magistrates to take notice of the chemical questions brought before them, would you kindly favour me with a little space so as to place the matter in a clear light before the public? Having learnt that at the first hearing the magistrates decided on sending the sample to Somerset House, I at once divided the portion which remained after my own analysis into two parts, one of which was kindly analysed for me by Mr. Stoddart, of Bristol, with the result that it contained "2 *per cent. of fat*." The other portion I analysed myself several times by different methods, but before giving the results it is necessary to state that when milk becomes sour, it is due to a portion of its solid constituents changing into lactic acid and gaseous products. This acid being like fat soluble in ether, would, if the milk were analysed by the process usually applied to new milk, be weighed with and reckoned as fat, thus giving too high a per centage. This it would appear the Somerset House authorities must have done, as my first analysis of the sour milk by this process gave 2·68 per cent. soluble in ether, the Somerset House result being 2·69. It is impossible to state positively that this is the case, as they give no other figures whereby an absolute conclusion can be formed, but the two numbers are so close that there is no reasonable doubt that the authorities used the process for new milk, and thus estimated acid and fat together. This is rendered the more probable, as my other analysis of the same sample gave from 2 to 2·25 per cent. of fat, thus not only corroborating my first result, but also coinciding with Mr. Stoddart's analysis.

The following figures will speak for themselves as to the reliance to be placed in the Somerset House authorities. In August of last year, a sample of milk sent from Bath to Somerset House was found by the analysts there to contain—water, 89·99; fat, 2·18; solids, 7·83; and was pronounced by them *to be unadulterated*.

On January 22nd, 1878, they gave the following reports on two samples forwarded from Kensington, London:—one, water, 89·09; fat, 3·22; solids, 7·69. Two, water 88·62; fat, 3·43; solids; 7·95. The first of these they stated *to be adulterated with not less than* 7 *per cent.*, and the second *with not less than* 4 *per cent. of water*.

Now, if you will kindly compare the above figures, you will perceive that in every particular, the Bath milk pronounced unadulterated was of a worse quality than the adulterated London ones, and these dicta were pronounced within four months of each other by the same authority, and signed by the same gentlemen. Further comment is superfluous. J. W. GATEHOUSE.

Bath.

LAW REPORTS.

THE ARSENICAL VIOLET POWDER CASE.

At the Central Criminal Court, on the 7th of August, before Mr. Justice Field, Henry George King, surrendered to take his trial upon several indictments for manslaughter. Mr. Poland and Mr. Straight prosecuted for the Treasury; Mr. Warner Sleigh and Mr. Crispe were counsel for the defence.

The case that was taken charged the prisoner with the manslaughter of a child named Ringrose.

On behalf of the prosecution it was stated that the prisoner carried on the business of a wholesale druggist and drysalter at Kingsland Green and had for several years been in the habit of manufacturing the article known as violet powder, which, under ordinary circumstances, appeared to be composed of starch and orris root, or some description of perfume. In 1875 the prisoner commenced the manufacture of some cheaper description of powder, in which terra alba, or sulphate of lime, was substituted for starch, and this article was sold by him to a very large extent in penny packets, which were labelled "For the Nursery, Superior Violet Powder, warranted free from grit." The ordinary article manufactured by the prisoner appeared to be perfectly harmless, but about twelve months ago the violet powder sold by him was found to be largely impregnated with arsenic, and the result was that a great number of children of poor persons residing at Loughton, where the powder was extensively used, lost their lives, that result being undoubtedly attributable to the large quantity of arsenical poison contained in the violet powder sold by the prisoner. The fact of so many children dying in such an extraordinary manner attracted the attention of the local authorities in the first instance, and eventually the Government interefered in the matter, when an enquiry took place at the instance of the Treasury, and in the result the prisoner was committed upon the present charges. The child whose death was now the special subject of enquiry was the daughter of a woman who resided at Shacklewell. It was about ten days old at the time of its death, and it appeared that the powder supplied by the prisoner had been constantly applied to it from its birth. A *postmortem* examination by

Dr. Tidy led to the discovery that the liver and other organs were largely impregnated with arsenic, and the death was clearly proved to be the result of arsenical poisoning. The portion of the penny packet of violet powder which remained was also analysed, and was found to contain arsenic in the proportion of thirty-eight parts out of one hundred, a quantity quite sufficient to account for the results that happened. The prisoner was examined as a witness before the coroner; he appeared anxious to give all the information in his power, and declared that he was entirely ignorant as to the way in which the arsenic had got into the violet powder. It also appeared that when his attention was called to the fact that the violet powder sold by him contained a large quantity of arsenic, he directed his traveller to get back all the packets he had sold to his various customers, and the whole that remained in his possession was destroyed. The case for the prosecution rested entirely upon the assumption that the prisoner had been guilty of criminal negligence in selling such a dangerous ingredient to the public.

Dr. Tidy, professor of chemistry at the London Hospital, said arsenic was a very much heavier article than terra alba, and the bulk of the latter would consequently be much greater than that of arsenic. It appeared to him that a person of ordinary skill and caution, while making up packets of this description, ought to have detected the difference between the two articles. He believed that a portion of the arsenic found in the body of the deceased child had been absorbed through the skin and that another portion had passed off into the air while the child was being dusted with the powder, and been taken into the system through the mouth.

In answer to questions put by Mr. Warner Sleigh, in cross-examination, Dr. Tidy said that the body was very much decomposed, and although it had been generally considered that arsenic was a preventive of decomposition, he had heard of cases where it had not had that effect, and he therefore did not regard it as a positive fact that the presence of arsenic would delay or prevent decomposition.

A long statement made by the prisoner to a detective officer was put in and read. In this statement the prisoner described the articles used by him in the manufacture of the violet powder, the principal ingredients being corn flour, terra alba, orris root, potato starch, and rose perfume. He denied most positively ever having had any arsenic in his possession, and stated that he could not in any way account for the arsenic getting into the violet powder, but he suggested that upon one occasion when he sent to the shop of Mr. Fox, a wholesale chemist and druggist in Bethnal Green Road, for 28lb. of terra alba, arsenic had been sent to him by mistake.

Mr. Henry Fox, jun., was called to disprove the suggestion of the prisoner. He stated that he did not remember the prisoner having been supplied with 28lb. weight of terra alba, and he did not think it possible that such an occurence as sending arsenic by mistake for terra alba, could have taken place. In reply to Mr Warner Sleigh, in cross-examination, the witness said the wholesale price of arsenic was £11 or £12 per ton, whereas terra alba was not worth more than £3 or £4 per ton, so that it was clear that in the sense of cheapness there was no inducement for the prisoner to make use of arsenic instead of terra alba.

Mr. Justice Field, at the close of the case for the prosecution, said he did not know what the jury thought of the case, but he certainly could not see what criminal negligence could be attached to the prisoner. The Foreman of the Jury said that a majority of them were of opinion that the death was the result of accident. Mr. Justice Field said that the opinion of a majority of the jury was not sufficient.

Mr. Poland, in the course of a brief summary of the evidence, said that when the jury heard that 28lb of a deadly poison had been distributed for the purpose of being used upon the bodies of young children, and the fatal results that had attended it, he was sure they would be of opinion that the case was, at all events, one that ought to be fully inquired into.

Mr. Justice Field said it was doubtless a proper case to be fully investigated.

Mr. Poland added that the only question for the jury was, whether the prisoner was guilty of criminal neglect in supplying this poisonous article to the public.

Mr. Warner Sleigh briefly addressed the jury for the prisoner, and contended that the prosecution had utterly failed in establishing any criminal negligence on the part of the prisoner, and that they ought to acquit him.

Mr. Justice Field, in the course of a short summing up, said that, whatever might be the result of the inquiry, he thought there could not be any doubt that from the very first the prisoner had met the charge most fairly, and that he had not only given all the information that he could in reference to the matter, but that the moment he was informed that there was some dangerous ingredients in the violet powder manufactured by him, he took measures to get back all he could of it, and destroy it. He then explained that before the jury would be justified in convicting the prisoner of this offence they must be satisfied that he had been guilty of some gross and criminal neglect.

The jury at once returned a verdict of Not Guilty.

Mr. Poland said that, after the full inquiry that had taken place, he did not think it advisable to proceed with any of the other indictments against the prisoner.

Verdicts of not guilty were, therefore, taken on all these cases, and the prisoner was ordered to be discharged.

CHARGE OF SELLING ADULTERATED TINCTURE OF JALAP.

At the Romsey Borough Bench, Mr. William Blissett, dispensary chemist, was summoned, on the information of Superintendent Kellaway, with selling adulterated tincture of jalap. Mr. Glaisyer of Birmingham, solicitor to the Chemists and Druggists' Trade Protection Society, appeared for the defence.

Superintendent Kellaway deposed to having purchased from the defendant three ounces of tincture of jalap, and told him the purpose for which it was bought. It was divided in defendant's presence into 3 parts. One part he delivered to defendant, one to the analyst, Mr. Angell, the same day personally, and he produced the third part. He also produced the certificate of the analyst, which stated that "The strength of the spirit equal to 16 per cent. under proof or 40·66 per cent. of alcohol by weight.

"*Observations.*—This tincture should be made with proof spirit. There is therefore a deficiency of alcohol to the extent of at least 9 per cent by weight. Three per cent. may fairly be allowed for loss of alcohol during preparations of tincture."

Mr. Glaisyer here asked that the analyst should be put into the witness box by the prosecutor, but this was refused. Mr. Glaisyer said he had given notice for Mr. Angell's appearance, and that the case for the prosecution would be incomplete if he were not called.

The Magistrates decided that the prosecution could not be compelled to put the analyst in the witness box. Mr Glaisyer thereupon called for Mr. Arthur Angell, the county analyst, who on entering the box asked the magistrates to whom he was to look for his expenses. Mr. Glaisyer said under the circumstances he would guarantee the fees, but he protested against the decision.

On being sworn Mr. Angell gave the following evidence in answer to Mr. Glaisyer: I am public analyst for the county of Southampton. The certificate produced is mine, and the contents are here.—Cross-examined: I had the sample personally from the superintendent. I did not weigh the quantity of tincture I received. Tincture of jalap is made by steeping the jalap bulb in spirits. I am not a pharmacist. I obtained my knowledge from study. I do not remember what proportion of jalap is used in preparing the tincture. The tincture should contain 49 per cent. of alcohol and 51 per cent. of water. This is the liquid portion. I am not prepared to say what proportion of liquid there should be found in 100 parts of tincture of jalap. I cannot tell how much solid matter and how much liquid there should be in 100 parts. I have allowed three per cent. for solid, as stated in my certificate. There would be solid matter in the tincture. I believe the quantities should be 2½ ounces of the bulb to a pint or a *litre* of spirits. I am, however, not certain, but I think it is a pint. I did not weigh the solid matter. I took a weighed quantity of the sample and distilled it. I then took the distiliate and made it up to the same bulk as the sample. The temperature of my distillate was about 15 degrees centigrade. I then took the specific gravity; the result was that the distillate ranged sixteen under proof. The solid matter is the active principle. I believe the spirit is of use medicinally. I believe there was sufficient pure jalap in the tincture to perform the functions of the medicine. I believe the absence of the alcohol did not at all affect the efficiency of the preparation.

At this stage of the examination the magistrates said they should not require Mr. Glaisyer to reply for the defence, as they had decided to dismiss the information.

An application made by the solicitor for the defence for costs was refused.

At the Bath City Police Court, recently, Francis Hilyer, dairyman, of 2, Upper Lambridge Street, was summoned for selling to Inspector Montague a pint of milk, not of the nature, substance and quality demanded, to his prejudice, on June 25th. Mr. Moger, clerk to the Urban Sanitary Authority, appeared to support the prosecution; and Mr. J. K. Bartrum represented the defendant. Mr. Moger said in this case the deprivation of fat was very considerable, which must have a very deleterious effect upon the health of infants and others who required pure milk. The certificate of the analyst, Mr. J. W. Gatehouse, was as follows:—Water 88·50, fat, 2·20, ash, 0·72, caseine and sugar, 8·58, total 100. He was of opinion that the milk was deprived of 25 per cent. of its fat. Mr. Montagu deposed to purchasing the pint of milk of a man in the employ of the defendant, for which he paid him 2d. In answer to witness the man said he did not want to take a portion of the sample. Mr. Bartrum said the milk was purchased by the defendant, of two very respectable men, who he believed incapable of selling adulterated milk—Mr. Dill and Mr. Shellard. He had not very great confidence in the test of the city analyst, and their worships would recollect that he had been found to be wrong in one or two instances, when the articles were subsequently sent to Somerset House. He was requested in this instance to ask that the milk be sent to Somerset House, and that the question of costs be deferred. The Bench assented to that application, and the case was consequently adjourned for that purpose.

At the adjourned hearing on the 12th August, Mr. Payne (clerk to the magistrates) informed the justices sitting in petty sessions, that he had received a report from the authorities at Somerset House, which was to the effect that the milk contained 2·69 per cent. of fat. That amount, though lower than was found in average milk of good quality, was equal to that of low quality. They therefore did not feel justified in saying that any of the cream had been abstracted. The certificate was signed by J. Bell and

R. Bannister. Mr. Moger made some remarks tending to show that the difference in the analyses was due to the different times at which the tests were made. The Chairman said that although they were anxious to support the city analyst they could not enter into a chemical question. The case was then dismissed.

At Brentford Petty Sessions, Mr. J. R. Hogarth in the chair, Mr. Samuel Foss, grocer, High Street, Brentford, was summoned by Mr. Gregg, an inspector under the Adulteration Act, for selling, to his prejudice, an article of food purporting to be butter, which was not of the nature, substance, and quality demanded. Mr. Gregg stated that on June 14 he visited the defendant's shop, and bought a pound and a half of butter at 1s., at the same time telling defendant that he wanted it for the purpose of sending it to the county analyst for examination. Defendant then said "I will not sell it to you as butter, but I will sell it as 'bosch' butter," to which witness returned "It doesn't matter. You have given me the price of butter, and you may call it by any name you like." He told defendant it was necessary for him to put a label on the butter if he intended to sell it as "bosch," and defendant then gave him a piece of paper from a packet lying on one side. Witness paid 1s. 6d. for the sample. He produced the analyst's certificate, which stated, "I am of opinion that the said sample contained no true butter. It consisted entirely of foreign fat other than butter fat, but such fat is not injurious to health." The Chairman: In other words, there was not one particle of butter in the sample you sent up to the analyst? Mr. Smith: I am quite content. It was not injurious to health. Mr. Smith submitted that the summons was altogether a fallacy, inasmuch as the purchase was not to Mr. Gregg's prejudice, and he (Mr. Smith) quoted a case showing that as the tradesman was compelled, under a heavy penalty, to sell any article of food demanded by an inspector, every consideration should be given to the terms of sale. Defendant was then called. He produced an invoice showing that the article was consigned to him as "bosch" and said that "bosch" and butter were considered by the trade as two distinct commodities. He distinctly told Mr. Gregg that it was not butter, when the latter asked the price of it. Gave Mr. Gregg a paper containing the words — "Notice.— This article is sold as imported, without warranty." These papers were kept on the counter. Mr. Gregg pointed to the "bosch" and said, "What is the price of that?" Was quite certain he did not use the word "butter" at first. As soon as he called it butter witness said—"We don't sell that as butter; it is invoiced to us as 'bosch,' and we sell it as 'bosch.'" Mr. Gregg repeated, "I'll take a pound and a half of that butter," pointing to the "bosch," and witness replied "I won't sell that as butter." Mr. Gregg then said, "Well, I'll take a pound and a half of it," and witness answered, "Wait till my assistant comes in, and then I'll serve you." He did not serve him till the assistant came. By the Chairman: Had been in business two years. Had never had a single customer ask to be served with "bosch." The Chairman: What do they ask for? Witness: They ask for butter. By Mr. Gregg: Gave the printed notice before he had served the "butter." The Chairman said the magistrates had given the case special care and attention, and they felt that they could only arrive at the conclusion that the evidence given by the inspector was truthful. He (the Chairman) had put the question to defendant as to whether he had ever known a customer enter his shop and ask to be supplied with "bosch," and the reply, unhesitatingly given, was "Never." There was no ticket on the article, and he considered it very cruel that it should be sold to poor people as butter. Defendant might or might not give the purchaser a notice like the one that had been produced, but that did not state the article to be "bosch." The preparation was no doubt meant for the consumption of the poor, and it was a very hard thing that they should be deceived. Defendant might formerly have conducted his business in a proper manner, but it was not respectable to sell "bosch" for butter. It was the duty of the magistrates to convict him, and the only question was as to the amount of the penalty. He (the Chairman) thought that, properly speaking, it ought to be £20, the full fine, but some of the magistrates thought differently, and the penalty the bench inflicted was £5, or two months' imprisonment.

At the Wolverhampton police court, before Mr. Isaac Spooner (Stipendiary), Mr. Henry Round, grocer and provision dealer, was summoned for selling adulterated bread. Mr. Vaughan appeared for the defence. Samuel Foy, assistant to Mr. J. G. Horder, the inspector under the Food and Drugs Act, for the district of South Staffordshire, proved to buying a loaf of bread from the defendant's shop, and upon it being forwarded to Mr. Jones, the county analyst, he certified that it contained 28 grains of alum to the 4lb. loaf, and in his opinion such a proportion would tend to make bread indigestible, and thus injurious to health. In cross-examination Mr. Jones said the case was an average one of alum adulteration. He had, however, found as much as forty grains in a 4lb. loaf in a former case. Mr. Vaughan for the defence, said the defendant had been in the habit of buying his flour from respectable tradesmen, without having the slightest doubt as to its genuineness. He could also prove that in the baking process no alum whatever was placed in the flour. The Stipendiary said he should like to know if Mr. Horder pressed for a heavy penalty; and he replied that he did not know of anything to take the case out of the ordinary line. The Stipendiary said it was a very serious offence to sell adulterated bread, and he should fine the defendant £10 and costs.

An Impudent Skim Milk Seller.—Richard Bevan, of Doctor's Piece, Willinhall, was charged with selling adulterated milk. On being charged, the defendant sarcastically remarked: A penny a quart

Mr. Spooner: I don't care if it was a guinea a quart. Defendant: A ha'porth of milk; I should be ashamed to bring it into court. Mr. Spooner: Be quiet. You shall not sell milk and water as milk; if you do I shall punish you. Samuel Toy, assistant to Mr. Horder, proved purchasing half a pint of skim milk, and sending a portion of it to Mr. Jones for analysis. The certificate of analysis of Mr. Jones was then handed in, and Mr. Spooner said 17 per cent. of water had been added after the cream was taken away. Defendant said he should be ashamed to have a man brought into court for a quart of skim milk. Mr. Spooner told him he should not allow him to get money from people for milk and water as milk. He would be fined £2 and costs "for selling skim milk and water as milk." Defendant made a sweeping accusation against the magistrate and inspector, whereupon Mr. Spooner told him if he did not keep a civil tongue in his head he should punish him.

NOTES OF THE MONTH.

The *Brewer's Guardian* in waxing jubilant over the recent dictum of the Lord Chief Justice that a sale to an inspector is not to the "prejudice of the purchaser," has the following beautiful little specimen of trade journalism.

"The Adulteration Act was intended to protect poor persons from being imposed upon; if they have reason to suspect any article they have purchased has been adulterated, they can get it analysed for themselves, at nominal fees, or report the matter to the local inspectors; but we feel convinced the framers of the Act never intended that inspectors should be continually roaming about to obtain samples for the purpose of analysis, often only with the view of harassing and annoying a respectable tradesman."

The Act was undoubtedly made to protect the poor, and the appointment of Inspectors is the only way by which such protection can be obtained. We can well picture the Brewer and his friend the respectable (?) tradesman rubbing their hands with glee over the passing of an Act which would protect the poor man by compelling him first to find the necessary bottles, corks, and wax for dividing the sample; secondly, to advance the necessary sum of half-a-guinea for the analysis, on the chance of recovering it afterwards on conviction; and thirdly, to lose one half-day's work in taking the sample to the analyst, and another in attending the police court. We fear that the *Brewer's Guardian* in the character of the *Poor Man's Guardian* savours somewhat of the wolf in sheep's clothing.

Recent correspondence in the *Grocer* shows that the National Chamber of Trade has not been slow to take what advantage it could of the introduction of Mr. Isaac's amendment into the abortive Sale of Food and Drugs' Amendment Bill, sanctioning the sale of spirits diluted by water without defining any standard of strength, but only vaguely stating that regard should be had both to the extent of the admixture and the price at which the article is sold. In writing to Mr. Sclater-Booth, on the subject, Mr. Morrison, the Secretary, remarks, "it would be most unfair and illogical not to "recognise the same principle in the case of milk, or any other liquid or compound article "of food not injurious to health." We cordially agree with Mr. Morrison's remarks, as it is absurd to say that a publican should be permitted to dilute without making a declaration or being bound to a standard, while the unfortunate milkman who may follow his example is to be fined. It is stated that Mr. Anderson now bitterly regrets that he consented to Mr. Isaac's amendment, and as a thinking man anxious to protect the public, he must feel that he has much cause to do so. But the worst complication was still to follow when the amendment was supported by the government, which is now pledged in principle to a course of action, which if logically carried out, must lead up to the point that a tradesman may sell without declaration any mixture he chooses, and so make a profit at the expense of his customers, so long as he does not introduce anything dangerous to health. So after all the National Chamber of Trade may congratulate itself that its advice was not listened to.

The necessity, however, for a comprehensive amending Act is becoming more and more apparent every-day, and the course lately adopted by the Hull Sanitary Committee affords another good illustration of it. Acting on the advice of the Town Clerk, they decided not to prosecute in five cases of adulteration; first, because of the recent decision that an Inspector when purchasing samples must use the exact words of the Act, and not merely state that they are being purchased for analysis; and secondly, because of the view held by the Lord Chief Justice, or as Mr. Sclater Booth called it, "the arbitrary dictum of one learned judge," than an Inspector was not prejudiced by the sale to him for analysis of an adulterated article. Although the decision of the Sanitary Committee is much to be regretted, it is satisfying to note that the opinion of the Town Clerk, which was evidently based upon an imperfect knowledge of the facts was not allowed to pass unquestioned, even in the Hull local papers.

We really hardly know whether to congratulate or sympathise with Faversham. It may be remembered that early in the present year the Town Council twice refused to appoint a Public Analyst, but ultimately, after receiving a third letter from the Local Government Board on the subject, agreed—though by no means unanimously—to have the terrible official the Board thought such a town should possess. Some six months or so after this reluctant decision was come to we hear of a gentleman being appointed to the post. However, better late than never, say we, and we can only hope that his office may not be made a sinecure, and that the members of this Town Council may soon find that the provisions supplied to them have improved in quality, which, we presume, is the only fact that would convince these sons of Solomon that wisdom is not the exclusive possession of Town Councillors.

We cannot help referring to another benighted place with a Town Council composed of wiseacres who are so satisfied with the condition of their town that they, like the Faversham Councillors, object to a Public Analyst coming in their midst, and in reply to a communication, the Town Council of Godalming have informed the Local Government Board that they consider a Public Analyst for that place is not needed! We don't know what these Town Councillors are, whether tradesmen or manufacturers, but we hardly think they are competent to decide whether the town needs an Analyst. We should think the inhabitants—and especially the poorer class—would have given a different opinion as to the necessity of appointing one, and we have no doubt that in twelve months the gentleman appointed, if supplied with samples for analysis, would show such a *raison d'etre* for his office as would utterly astonish these intelligent Town Councillors.

Perhaps we ought to apologize to our readers—we hardly know—for not publishing the address of the President of the British Association, but when we saw that nearly every journal—medical, chemical, or comic—had found room for it, we came to the conclusion that it would be better, considering our limited space, not to bore our readers with even an abstract of it; not by any means because the address was a bad one, but even chemists may have too much of a good thing.

Godalming.—At the quarterly meeting of the Town Council a letter from the Local Government Board was read asking why a public analyst had not been appointed, and after a short discussion it was decided that they should be informed that "in the opinion of the Town Council a public analyst is not needed."

Mr. Sidney Harvey has been appointed Public Analyst for Faversham.

The Hull Sanitary Committee and Adulteration.—A meeting of this committee was held at the Town Hall lately, Alderman King, M.D., in the chair. The Town Clerk (Mr. Todd) reported with respect to five cases of alleged adulteration referred to him that he recommended no prosecutions in consequence of two recent legal decisions. By the first decision it was necessary that the inspector, on purchasing, should state not only that the articles were for analysis, but that they were for analysis by the borough analyst. The next decision was the more important one, for if it was confirmed the Act was rendered nugatory, and would require amending in the future. The decision was that a borough Inspector was not a person prejudiced, as he did not purchase the articles to eat. Several of the committee remarked that it was an unfortunate state of affairs and adulteration might be as rife as ever unless private persons purchased goods and employed analysts at their own expense. A resolution was passed adopting the recommendation not to prosecute. *Eastern Morning News.*

RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1877. No.	Name of Patentee.	Title of Patent.	Price.
4576	M. Hilton	Manufacture of Gas	8d.
4647	C. D. Abel...	Manufacture of Loaf Sugar	6d.
4771	F. A. Zimmerman...	Treatment of Pyroxylin	6d.
4832	H. Simon	Process and Apparatus for Developing Bromine... ...	2d.
4880	W. Weldon	Manufacture of Soda and Potash by the Leblanc Process	4d.
4888	S. Pitt	Agglomerating Chemical Substances	2d.
1878.			
12	H. Robinson and J. C. Mellish ...	Treatment of Sewage and Impure Waters	4d.
36	W. R. Lake	Artificial Caoutchouc	4d.
92	W. East	Treatment of Sewage and other Waters	4d.
120	W. R. Lake	Treatment of Carbonated Mineral Phosphates	4d.
133	W. Weldon	Manufacture of Soda and Potash	4d.
186	R. Messel	Manufacture of Sulphuric Acid	4d.
195	F. H. Atkins	Preparing Materials for Filtering Water...	4d.
208	J. H. Johnson	Dyeing	4d.
230	R. W. Wallace and G. Christopher	Purification of Gas...	4d.
256	W. Majert	Manufacture of Sulphuric Acid	2d.
304	T. T. Jones	Manufacture of Nitro-Glycerine	2d.
356	G. W. Von Nawrocki	Manufacture of Soda and Potass	4d.
523	H. Simon	Carbonizing Wool, Rags, &c.	4d.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical *Examiner;* The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The *Medical Record*; The Miller; The Anti-Adulteration Review; Journal of Applied Science; The County *Brewers' Gazette*; The Dairyman; The American Dairyman; The Practitioner.

THE ANALYST.

OCTOBER, 1878.

ON THE INCONSTANT COMPOSITION OF WELL WATERS.

By Charles A. Cameron, M.D., Fellow and Professor of Hygeine and Chemistry, R.C.S.I.; Medical Officer of Health for Dublin.

Read before the Society of Public Analysts, at Dublin, 19th August, 1878.

For some time past I have been engaged in examining the water of deep wells, and I have noticed the important fact that very often the water varies in composition at different levels in the same. Well, the most remarkable instance of this kind which I have, up to the present discovered, is that afforded by a well at Glenfarme Hall, near Enniskillen, the residence of Mr. A. Loftus Totterham, D.L. Two specimens of water taken out of this well, one a few minutes after the other, were found to have the following composition:—

	No. 1. Grains.		No. 2. Grains.
Total solids per gallon	29·012	—	47·40000
Including—			
Albuminoid Nitrogen	0·625	—	0·0060
Saline Ammonia	0·010	—	0·0003
Chlorine	2·137	—	1·795

The water marked No. 1 was yellowish and very impure. It was in fact a very bad water. No. 2, on the contrary, was colourless, bright, and remarkably free from organic matter. It was very much harder than No. 1. In this case, therefore, a bad water and a good one were simultaneously procurable from the one well. The bad water was obtained by dipping a vessel into the well; the good water was pumped up from the bottom of the well, which was more than 50 feet deep. It was clear that the lower part of the well was supplied with water derived from springs; or, at any rate, which had percolated through a large amount of soil and had become purified, so far as its organic matter was concerned. The upper part of the well contained surface drainage, which appears to have floated upon the somewhat heavier water beneath. Specimens of water were a second time procured from this well, and again it was found that the water near the bottom was harder and purer (from organic matter) than that near the top.

In four waters from deep wells, which I have quite recently examined, I found that the composition of the water in each varied somewhat according to the depth. In one case the solids amounted to 66·23 grains per gallon at the bottom of the well, whilst nearer the surface the solids were only 3 grains per gallon. We may, in short, have two kinds of drainage water collected in the same well,—namely, surface drainage, and arterial or deep drainage.

It does not, however, always happen that the water in a deep well varies in quality according to the level at which it is collected, for I found no such variation in the waters of several very deep wells.

NOTE ON THE ESTIMATION OF LEAD AS PLUMBIC IODATE.

By Charles A. Cameron, M.D., Professor of Chemistry, R.C.S.I.

Read before the Society of Public Analysts, at Dublin, on 19th August, 1878.

I have found that iodate of lead is more insoluble than the sulphate, and, indeed, is practically an absolutely insoluble salt. I propose, therefore, to estimate lead as plumbic iodate. If a volumetrical method be preferred to a gravimetrical one, the lead should be precipitated by a standard solution of sodium iodate, and the excess of sodium iodate determined by the hydrochloric acid and sodium hyposulphite method. The plumbic iodate must be well washed and the washings added to the filtrates. As it is difficult to obtain pure iodic acid or alkaline iodates from the shops, the sodium iodate solution must be standardized by means of a solution of pure nitrate of lead.

As most soluble salts dissolve to a slight extent the iodate of lead; it must be precipitated from a solution free from saline substances.

ON SOME EXPERIMENTS WITH THE SILICATED CARBON AND SPONGY IRON FILTERS.

By G. W. Wigner, F.C.S.

When staying at Margate recently I was dissatisfied with the character of the water supply, which was not, in my opinion, fit for drinking, and as it was therefore necessary to provide a filter, I considered it a good opportunity to test two of the rival filters which are among the most extensively advertised. The London water, although it is not by any means perfect, is yet too good to give any value whatever to the results of such an experiment. The Margate water, besides being evidently contaminated by infiltration from the sea, has a very unpleasant smell and taste, and the microscope shows a variety of objects which might be more readily passed in surface drainage than in drinking water. It was therefore fairly suitable for such an experiment.

The two filters chosen for the purpose were the "silicated carbon" and the "spongy iron," both were perfectly new and bought direct from the makers. As regards the construction I may just note for the information of those who have not seen both, that the principal mechanical advantages of the silicated carbon are—that the filtering body is a porous slab, cemented into the stoneware—so that it is impossible for any portion of the liquid to escape without passing through the entire thickness of the filtering material. The advantage of this is obvious, while the fact that this porous slab is effectively aërated every time the filter is allowed to run dry is no small advantage. On the other hand the speed of filtration cannot be regulated, and in practice it is somewhat irregular. In the spongy iron filter the regulation of the speed of filtration, though somewhat troublesome to the user, is very efficient; but owing to the very coarse grain of the principal filtering material it is not only possible but probable that a good deal of the water escapes without having been subjected to the influence of the spongy iron at all. The rate of filtration is much slower than in the silicated filter.

I did not consider it of any use to test these filters while quite new, as it must be

evident that if they were not capable of working satisfactorily for a few weeks on such water as that used the experiment was concluded. They were therefore put up side by side—filled regularly as nearly as possible with the same quantity of water and at the same time, the amount being about two gallons per day each and allowed to work thus for five weeks.

During this time I found that the silicated water was always preferred for table use. Even those who were entirely ignorant of the fact that filters were used would sometimes complain of a flat taste in the spongy iron water.

Since it is obvious, from what I have said, that each filter possesses advantages peculiar to itself, I determined, in addition to testing the water which had simply passed through each filter, to test samples which had passed through both, and as it seemed possible that the order in which the filters were used might make some difference, it was decided to try with silicated filter first and with spongy iron first. I therefore had in all five samples, viz. :—

1. Water from main.
2. Ditto filtered through silicated carbon filter.
3. Ditto filtered through spongy iron filter.
4. Ditto filtered 1st through silicated carbon and 2nd through spongy iron.
5. Ditto filtered 1st through spongy iron and 2nd through silicated carbon.

The samples were distilled for ammonia as soon as possible. The following are the results of the five analyses :—

	No. 1 Tap in Main.	No. 2 Silicated Carbon Filter.	No. 3 Spongy Iron Filter.	No. 4 1st Silicated. 2nd Spongy.	No. 5 1st Spongy. 2nd Silicated.
Colour	Yellow Green Slightly Opaque	Pale Blue	Pale Blue	Opaque Blue	Chalky Blue
Suspended Matter ...	Traces	None	None	Traces	Slight Traces
Smell	Offensive	Very Slight	Offensive	Decidedly Offensive	Decidedly Offensive
Taste	Slightly Offensive	Saline	Saline and offensively flat	Unpleasant and very flat	Excessively flat and objectionable
Hardness before boiling	27·2°	16·9°	11·6°	14·0°	17·1°
Hardness after boiling	9·4°	5·3°	9·3°	10·7°	7·2°
Total Solids... ...	69·60	66·90	58·35	60·70	69·75
Loss on Ignition ...	5·80	6·80	5·35	4·80	9·40
Total Mineral Matter	63·80	60·10	53·00	55·90	60·35
Chlorine as Chloride of Sodium ...	36·66	36·66	36·46	36·50	36·50
Nitrogen as Ammonia	None	None	·0728	·0875	·0149
Do. Albuminoid Ammonia	·0033	None	·0161	·0140	·0051
Do. Nitrates	·7500	·7300	·6600	·6600	·7300
Do. Nitrites	Traces	Traces	Traces	Traces	Traces
Total Nitrogen in these 4 forms...	·7533	·7300	·7489	·7615	·7500
Oxygen absorbed from Permanganate	None	None	·0630	·0314	·0183
Microscopical Examination of Residue ...	Very bad Animal and vegetable debris. Some small spores. Quartz.	Organic debris minute traces only. Mineral matter traces.	Satisfactory It was very free from suspended matter.	Satisfactory	Satisfactory

On looking at these results, the first general feature which deserves attention is that the two filters when used together do not appear to have effected any additional

purification, but rather the reverse. It is very difficult to account for this fact. In both cases an ample quantity of the once filtered water was allowed to flow through the second filter so as to rinse it out, and the rinsings were rejected. It is true the filters were not continuously worked under these conditions for any length of time, but this ought hardly to be an essential for this experiment.

Leaving this I would next point out the special features shown by columns No. 2 and No. 3, which are the two filtered waters, as compared with column No. 1, which is the unfiltered.

Both filters have equally removed the yellow green colour of the water, and the suspended matter.

The silicated filter has greatly reduced the smell, but the spongy iron has merely changed its character, so that instead of resembling decaying vegetable matter it is a sort of indescribable smell, perhaps more resembling the smell of impure hydrogen produced by the action of acid on iron than anything else; but of course very faint, though offensive.

The taste has apparently been affected in a similar way. The silicated removed the offensive taste, and left only the saline. The spongy iron left the saline, but added to it a taste a little worse than if the water had been boiled, that is, there was something besides the flat taste. Bischof has alluded to a gas which he has observed within the bulk of spongy iron after it had been in use some time, which gas he says is sometimes explosive, sometimes not, and on one occasion he found this gas to contain a hydro-carbon; may not this hydro-carbon be the cause of this smell and taste?

The effects on the hardness are singular. The silicated reduced the temporary hardness by 6·2°, and the permanent hardness by 4·1°, total reduction 10.3°. The spongy iron reduced the temporary hardness by 15·5°, but only reduced the permanent hardness by a decimal. The spongy iron therefore reduces the total hardness the most, but bearing in mind the greater importance of permanent hardness, there is probably little to choose.

It is remarkable that the reduction of total mineral matter does not more closely follow this reduction of hardness. I have not yet made full mineral analyses of the residues to determine this point.

It is, however, in the ammonia and albuminoid ammonia, which are so often viewed as almost the sole proof of purity or otherwise, that the most important results appear. The silicated removes even the small proportion of albuminoid ammonia which was present, but the spongy iron produces a very marked proportion of free ammonia and so much albuminoid ammonia that the water would probably be condemned by those who trust mainly to that determination.

This result is a serious one, in whichever light we view it. If the albuminoid ammonia determination is of value, then *pro tanto* the filtered water is worse than the unfiltered. If the filter is a good one, and certainly many other experiments have pointed out that it is, then any analyst who reported on such a water, in ignorance of the fact that it had been through spongy iron, might be deceived. But still further, if spongy iron acts in this way, is it possible that metallic iron may in a less degree?

In considering this point all the special circumstances of the case must be borne in mind. For instance, the very saline character of the water, and the fact that this salt is partly due, in all probability, to infiltration from the sea, but still the fact remains.

It is unnecessary to go at length through the other columns. It is well, however, to point out that when two filters were used, in the case where the spongy iron was last the ammonia and albuminoid ammonia were almost as high as in No. 3, while, where the silicated was last, they were far less, though not so low as when the water passed through the silicated only.

It would be very desirable to have reports of similar trials on the water supply of other places, but I hope it will be possible to take the precaution of using new filters and keeping them at work for a month before taking the samples.

BRITISH ASSOCIATION MEETING.

The following are abstracts of two papers read at the Meeting in Dublin, and will be found of interest to our readers:—

MILK ADULTERATION.

By E. H. Cook, B.Sc.

Since the introduction of the Adulteration Act, the services of the public analyst had been most frequently called in to decide the question of the adulteration of milk; and he feared they must add that more unsatisfactory decisions were given than in other prosecutions. Instances had occurred in which innocent milk sellers had been fined for selling a pure article, and in many cases they might be sure the fraudulent dealer had gone unpunished. Milk was a substance which varied greatly in quality. In his own experience he had found a difference of as much as 18 per cent., and Dr. Voelcker had published analyses in which as great a difference as 25 per cent. occurred. As a result of four years' experience on this subject, it appeared to Mr. Cook that milk was subject to a variation owing to the food, a variation owing to the season, a variation owing to the animal, and a variation owing to health. The best milk was given by those cows which were fed on grass, and the better the grass (other things equal) the richer the milk. That the quantity of milk yielded by the same cow varied at different seasons of the year was well known, and the quality also varied considerably. Generally speaking, milk was richer in summer because the milk-producing articles were then available for food. Some cows gave better milk than others, which might be due to some individual peculiarity of the animal or to the breed. Guernsey was the best breed for quality combined with quantity. Devons produced milk rich in fat but were inferior to Guernseys. Herefords were good useful cows, as also were Shorthorns; but the first place must be given to Guernseys. Their milk is richer in solids and in fat, and the butter is of a finer colour. The course adopted by most analysts was to take as their standard the lowest percentage of solids or of "solids not fat" which pure milk had ever been found to contain; but this was open to objections. By the Adulteration Act the analyst was to fix the percentage himself, and it varied. In order that justice might be done, fraud detected, and the dignity of the chemist maintained, it was necessary to remedy that unsatisfactory state of things. Only one method appeared to offer a chance of success. Briefly, that was to buy and sell milk by quality instead of by quantity. One method of introducing the practice would be to divide the milk into two qualities, first and second, the former to include all milks containing 12 per cent. of solids, or 9 per cent.

of "solids not fat," and to be sold, say, at 4d. per quart, and the latter to include milks containing less than 12 per cent. of solids, or 9 per cent. of "solids not fat," and to be sold at a lesser price. The vendor thus selling according to the quality, no unjust prosecution could arise. Some efficient instrument, however, should be put into the hands of farmers and others, so that a rough analysis might be made, and the milk sold on the results obtained. This system, the author thought, would tend to stop adulteration, because it would no longer pay to adulterate, a better price being got for the better articles, and it would tend to put an end to those complaints of medical men, who, after advising their patients to take milk, found its effect so uncertain and unsatisfactory.

ON THE ADULTERATION OF DRUGS.

By Charles R. C. Tichborne, LL.D.

The author stated that in his paper he should not refer to the adulteration of the expensive drugs and chemicals such as saffron, scammony, quinia, nitrate of silver, which no doubt did occur; but a few recent experiences would illustrate the fact that adulteration is perhaps even more extensively carried on with cheap drugs than dear ones. He had been informed on good authority that powdered hematite—red iron ore—is frequently sold as the peroxide of iron. It is still a favourite remedy, particularly among amateur doctors; and as the Pharmacopœial article is only worth a few pence per lb., a variable rock with various proportions of oxide of iron—10 to 70 per cent.—should not be substituted for it. He was not, however, prepared to vouch for the correctness of this statement from actual observation; but the following instances had come under his own immediate notice:—

"Phosphorus and nitric acid," he said, "are not very dear substances, and therefore we would suppose that a preparation like phosphoric acid would always be made, as directed from those chemicals, particularly when sold as the B. P. acid; but I place before you a specimen of the so-called B. P. acid which is made from bone-ash and oil of vitriol. On reference to Watts' 'Dictionary of Chemistry,' vol. iv., pages 500 and 544, it is there stated that a very pure acid may be obtained by treating bone-ash with oil of vitriol, repeated treatment with H_2SO_4, evaporation, and other manipulations not necessary to specify in this paper. The writer says, after describing the process, 'The filtrate, when boiled, constitutes a solution of ortho-phosphoric acid, contaminated with a trace of sodium, but otherwise pure.' Now, whether it is possible to remove the whole of the lime and magnesia by easy and cheap means I am not prepared to say. But, as far as I can see, the sample of so-called phosphoric acid under examination more exactly represents the biphosphate of lime of the manure-makers than the Pharmacopœial acid. It gave a voluminous precipitate on adding chloride of ammonium and carbonate of ammonia, and also contained appreciable quantities of magnesium. Here we have a chemical product cheap in itself, cheap as regards the sources from which it is procured, and yet sold impure. The doctors' dose—30 drops—is not much, and yet it must be cheapened for the commercial greed.

"Linseed is a very cheap commodity, owing partially to the extensive cultivation of the plant for flax and other purposes, and also because, as regards the seed, we utilise the whole of the residue after expressing the oil. After getting the latter valuable

product we have the linseed cake, also valuable as a cattle feeder, which, when ground, is prized by the medical man for its emollient properties. Well may the plant be called *Linum usitatissimum*. Of such universal application is this substance that it becomes important that we should have it extremely pure and free from extraneous matter. Yet even the cheapness of this commodity has not saved it from the adulterator's hands. Extensively as it is pressed for oil, grapes are much more extensively pressed for wine and, unfortunately, the wine-grower cannot utilise the produce of his wine-press except for manuring his vineyard; therefore the wine-press residue may be practically considered as a dead loss. But one ingenous wine-grower bethought himself that, as he had a press, it was only necessary to add a little linseed farina to grape residue to produce a very presentable linseed cake, as far as the eye went. I show you now specimens of linseed cake manufactured abroad, in which the residue of the grape, stones and stalks, can be easily recognised by a very low power of the microscope."

Professor Tichborne next showed three samples of colocynth. Now the Pharmacopœia describes colocynth as "the dried decorticated fruit freed from the seeds." A colocynth apple had been found to be thus composed—

	Per cent.
Seeds (inert)	47·19
Rind (nearly inert)	33·78
Pulp	19·03
	100·00

So that, taking Meissner's analysis, which states that the pulp only contains 14 per cent. of colocynthin, we have—

	Per cent. of active principle.
Pure sample	14·3
Turkey pulp ground without removing seeds	4·2
Colocynth ground with rind and seeds	2·6

Of three samples shown to the Conference, Professor Tichborne said all were obtained in commerce.

"One is a sample of the very best average quality, but still containing a very large proportion of seed; in fact, it is very seldom without indications of the presence of that substance, and I believe it is generally the practice to powder the colocynthin pulp with the seeds remaining in it. The second sample is one which is much darker in colour, and consists of the whole colocynthin apple ground. The third sample is not only the whole colocynth ground up, but a sufficient quantity of potato starch, added to make the colour light—as well as being a profitable transaction. A medical man, indeed, prescribing 8 grains of such a powder, would be disappointed in the results."

PHARMACEUTICAL CONFERENCE.

We give below some abstracts of some papers read at this Conference in Dublin:—

THE TITRATION OF HYDROCYANIC ACID AND CYANIDES, AND ITS RELATION TO ALKALIMETRY.

By Louis Siebold, F.C.S.

Read before the British Pharmaceutical Conference.

Liebig's method for estimating the strength of hydrocyanic acid by means of decinormal solution of silver nitrate gives perfectly accurate results if the following precautions be observed:—

(1) The solution of sodium or potassium hydrate should be placed in the beaker first, and the hydrocyanic acid added to it from the pipette. If, instead of this, the acid is placed in the beaker first, and the alkaline hydrate added afterwards, there may be a slight loss by evaporation, which becomes appreciable whenever there is any delay in the addition of the alkali.

(2) The mixture of hydrocyanic acid and alkali should be largely diluted with water before the silver nitrate is added. The most suitable proportion of water, according to my experience, is from ten to twenty times the volume of the officinal or of Scheele's acid, which is more than twice the quantity recommended by Fresenius and other authorities. With such a degree of dilution the final point of the reaction can be observed with greater precision.

(3) The amount of alkali used should be as exactly as possible that required for the conversion of the hydrocyanic acid into alkaline cyanide, as an insufficiency or an excess both affect the accuracy of the result. With an excess the results are too high; with an insufficient quantity they are too low. The error due to the first named cause is but small and is pointed out in some of the standard analytical works, which therefore recommend the use of sufficient alkali to produce a distinct alkaline reaction and the avoidance of an undue excess. But it is just this direction which may lead a conscientious yet inexperienced manipulator to the far more serious mistake of using too little alkali, because litmus entirely fails to mark the point at which the hydrocyanic acid has been completely converted into sodium or potassium cyanide. These cyanides are so strongly alkaline to test paper, and hydrocyanic acid is so weak an acid that a mixture of the two may have a distinct or even a very strong alkaline reaction and yet contain a considerable amount of free hydrocyanic acid. Hence it follows that the use of a quantity of sodium hydrate quite sufficient to produce a strong alkaline reaction may only ensure the conversion of a portion, and perhaps of the smaller portion, of the hydrocyanic acid actually present into sodium cyanide. The inevitable result will be a serious error in the estimation, as the quantity of silver nitrate solution required to produce a permanent precipitate will only indicate that portion of the hydrocyanic acid which has entered into combination with the alkali; and this error may possibly amount to as much as 75 per cent.

I have alluded to this source of error at one of our previous meetings, in connection with a paper on the preservation of hydrocyanic acid, and I pointed out on that occasion that the alkalinity of the mixture at the end of the reaction, *e.g.*, after the addition of sufficient silver nitrate to produce a slight permanent precipitate, may be regarded as a sure indication that a sufficient quantity or rather an excess of alkali has been used, and that the result of the determination will be fairly correct, or in the presence of an undue excess of alkali a little too high. The alkalinity of the mixture of hydrocyanic acid and sodium hydrate completely ceases after the addition of the required amount of silver nitrate, unless some excess of alkali was used, and if it does cease, the result of the analysis will almost certainly be too low. My reason for again touching upon these points is that the neutrality of the double cyanide of sodium and silver (the product of this reaction), on which these conclusions were based, also forms the basis of my present communication.

From what I have already stated it is clear that the titr[illegible] lrocyanic acid with silver nitrate cannot give results of scientific accuracy [illegible]

used is exactly that required to combine with the acid, or unless a correction can be made for the excess of alkali employed. It is true that a slight excess of the latter does not appreciably affect the result, but then the question arises how to make certain that the excess used is but a slight one. It will not do to start with just sufficient soda to render the mixture alkaline and then to add gradually more as the alkalinity ceases during the titration, because in that case free hydrocyanic acid would be present in the mixture during nearly the whole of the process, and under the influence of the exposure and the continual stirring a portion would inevitably be lost by evaporation, thus causing an error which, though perhaps not considerable, is certainly greater than that which would result from the use of even an immoderate excess of soda to start with. I find, however, that the following *modus operandi* will meet the difficulty and ensure results agreeing perfectly with those gravimetric determinations:—The acid is allowed to run from the pipette into an excess of solution of sodium hydrate; decinormal solution of silver nitrate is then added drop by drop until a slight opalescence is produced, and this point being attained, standard normal hydrochloric or sulphuric acid is added until the opalescence begins to increase, which does not take place until the whole of the free alkali is neutralized. From experience I find that for each c.c. of standard mineral acid thus required 0·01 c.c. should be deducted from the volume of the silver solution used, and the remainder calculated for HCy. It will be seen that in this process the cyanide of sodium and silver acts as an acidimetric indicator, and indeed, it answers well for the purpose, for a single drop of free acid produces with it a very distinct precipitation of silver cyanide.

The fact, that in the abscence of a sufficient quantity of soda the volume of silver solution required to produce a permanent precipitate only indicates that portion of the hydrocyanic acid which has been used up in the formation of sodium cyanide, and that this determination of NaCy is in no wise affected by the presence of free hydrocyanic acid, renders this method applicable for the analysis of mixtures of the free acid and alkaline cyanides. Supposing the solution to be analysed contained free hydrocyanic acid and potassium cyanide, the volume of silver solution required to produce a permanent opalescence would show at once the quantity of KCy present. On now adding NaHo in slight excess and continuing the titration until the opalescence is again produced we find the quantity of free HCy. The results thus obtained are quite exact.

Before quitting this subject I wish to refer to a very handy process for the estimation of cyanides recently communicated to the Chemical Society by Mr. J. B. Hannay. It consists in the addition of decinormal solution of mercuric chloride to the hydrocyanic acid or cyanide rendered previously alkaline with ammonium hydrate, until a permanent precipitate is formed, which does not occur until the whole of the cyanogen has been used up in the formation of mercuric cyanide, as alkalies have no action on the latter. I have tried the process repeatedly with most satisfactory results, and believe that it will find much favour with pharmacists in the testing of hydrocyanic acid, especially as an excess of alkali does not affect its accuracy. But it cannot be used like the other for the analysis of mixtures of free HCy and cyanides.

I now come to the second part of my report, viz., the relation of the titration of cyanides to alkalimetry. It stands to reason that if an alkaline cyanide can be correctly estimated in the presence of free hydrocyanic acid by silver nitrate, this titration must answer as well for the estimation of a caustic alkali as for that of hydrocyanic acid. For that purpose the quantity of KCy or NaCy found, or the volume of silver solution

used, is simply calculated for KHO or NaHO instead of HCy. Now if the applicability of this test for alkalimetric purposes were confined to the determination of caustic alkalies, I feel certain that nobody would think of using prussic acid and silver nitrate in preference to the customary sulphuric acid and litmus; but I find that it answers equally well with the alkaline carbonates, and here I consider it decidedly preferable to the process in general use, for the following reasons:—

(1.) The solution of alkaline carbonate does not require boiling, as the carbonic acid does not interfere.

(2.) The change from perfect clearness to an unmistakable turbidity, as produced by a single drop of the silver solution, is more striking than that of the colour of litmus brought about by one drop of standard sulphuric acid.

(3). As a decinormal solution is used the results are more accurate than those obtained by normal H_2SO_4 or HCl.

(4). The results may be readily checked, without the necessity of operating on a fresh portion of the sample

(5). The chloride present in commercial alkaline carbonates can be estimated by the same process with but little additional trouble.

It is well known that hydrocyanic acid does not decompose alkaline carbonates at an ordinary temperature. But in the presence of silver nitrate the decomposition takes place in accordance with the following equation—

$$K_2CO_3 + 2HCy + AgNO_3 = KAgCy_2 + KNO_3 + CO_2 + H_2O$$

The first drop of silver solution added in excess precipitates silver cyanide.

$$KAgCy_2 + AgNO_3 = 2AgCy + KNO_3$$

The weak solution of the carbonate to be tested (about 0·5 to 1 gram in 100 c.c. of water) is mixed with 10 to 20 c.c. of hydrocyanic acid of Scheele's strength (a decided excess), and the decinormal solution of silver nitrate added drop by drop, stirring well all the time until a permanent turbidity is produced. Each c.c. of the silver solution required corresponds to 0·138 gram K_2CO_3 and to 0·0106 Na_2CO_3. I quote the results of a few determinations to show the accuracy of the process.

Pure K_2CO_3 used	Found
0·5850	0·5851
0·1670	0·1672
0·8775	0·8779
0·2088	0·2085

If after the addition of the required quantity of silver nitrate the mixture is boiled down to less than half its volume or until the excess of free HCy has been completely expelled, then mixed with a few drops of solution of potassium chromate and the addition of silver nitrate now proceeded with until the colour of the mixture changes to red, the volume of the test thus used will be found equal to that used in the first titration. This may serve to check the previous result. In the presence of chloride, however, the number of c.c. used in the second titration will be greater than that used in the first. The difference between the two exactly indicates the chloride

If 40 c.c. were used in the first and 45 c.c. in the second experiment the difference of 5 c.c must be calculated for chloride.

A few of my results will show the value of the method.

	Used.	Found.
(1).	Pure K_2CO_3 0·2000	K_2CO_3 0·2005
	Pure NaCl 0·0680	NaCl 0·0683
(2).	Pure K_2CO_3 0·9750	K_2CO_3 0·9750
	Pure NaCl 0·1825	NaCl 0·1830

Hence I believe, that this method merits the attention of those who are much engaged in alkalimetric estimations.

I have also employed silver nitrate with success in the analysis of mixtures of hydrocyanic acid and mineral acids, and indeed I find that these processes may be advantageously extended to other applications, but my experiments in this direction are not yet completed.

THE VOLUMETRIC ESTIMATION OF SOME IRON COMPOUNDS OF THE PHARMACOPŒIA.

By H. N. Draper, F.C.S.

The author said he brought forward his notes rather as queries than as results. Professor Tichborne had questioned to him the correctness of the figures given by the British Pharmacopœia in the volumetric estimation of arseniate of iron. The quantity of bichromate solution said to be necessary for the conversion of 2 grammes of ferrous arseniate seemed to Professor Tichborne too small. According to the British Pharmacopœia 100 c.c. of the solution are capable of converting from proto to per salt 1·68 gramme of iron. This statement is theoretically correct, and Mr. Draper found by actual experiment, taking the mean of three made with piano wire, that the actual quantity required was 97 c.c.

Now regarding arseniate of iron, the Pharmacopœia states that 2 grammes require 17 c.c. This is because the iron is in a "partially oxidised" condition. If it were possible to prepare the arseniate so that all the iron should be in a ferrous state the conversion would require 44·84 c.c. This shows that the British Pharmacopœia standard is that of a salt containing only 37·9 per cent. of absolute ferrous arseniate, a constitution which is but inadequately described by the phrase "partially oxidised." But on making the arseniate according to the Pharmacœpia instructions even this proportion of ferrous arseniate was not realized. The mean of three experiments gave only 21·7 per cent. Other specimens purchased in Dublin gave respectively 3·34, 5.2, 6.64 and 13·6 per cent.

A different result was obtained with the ferrous phosphate. The British Pharmacopœia requires a standard of 44·8 per cent. of absolute ferrous phosphate. By preparing the salt according to its instructions a proportion of 60·9 per cent. was obtained, and from four purchased specimens the following proportions were respectively found :—24·1' 29·6, 31·3, 49·2.

In magnetic oxide the British Pharmacopœia requires, by its volumetric standard, only a proportion of 28·8 per cent. of true ferroso ferric oxide. A specimen prepared according to directions, however, was found to contain only 19·4.

M. Teisserenc de Bort has just charged the Agronomic Institute to make a chemical analyses of all the wines sent to the Paris Exhibition. The number of samples to be examined is more than 10,000, coming from France, Spain, Italy, Austria, America, Africa, &c.

Mr. J. H. Collins, Public Analyst for the County of Cornwall, and for the Borough of Penzance, has been appointed Analyst for the City of Truro and for the Borough of Launceston.

ANALYSES OF BERLIN BEER.

THE following analyses are from the *Allgemeine Hopfen Keitung*, Beer brewed in the celebrated Brauerie Konigstadt, of Berlin, was found to contain as follows:—

LIGHT COLOURED BEER.

Alcohol	4·501	per cent. by weight
Saccharine	1·893	" "
Dextrine	0·861	" "
Albuminoids	0·630	" "
Hop-bitter, extractive and saline matter	2·296	" "
Acid...	0·005	" "

Unfermented extract 5·680 per cent.

DARK COLOURED BEER.

Alcohol	4·250	per cent. per weight.
Saccharine	1·950	" "
Dextrine	1·053	" "
Albuminoids	0·621	" "
Hop-bitter, extractive, and saline matter	3·386	" "
Acids	0·005	" "

Unfermented extract 7·010 per cent.

LAW REPORTS.

At the Southwark police court, Henry Hopkins, provision dealer, was summoned by the sanitary inspector of St. George's, Southwark, for selling as butter a compound containing not a particle of butter. Mr. Edwards said that he purchased at defendant's shop a half-pound of butter. It was labelled "Good butter, 1s. 2d. a pound." He paid 7d. for it, and took a portion to Dr. Muter's for analysis. He produced a certificate from the latter, setting forth that there was not a particle of butter in it, but it was not injurious to health. The defendant said he sold it as he received it from the wholesale dealer at Mile End. He thought the sanitary officers ought to look after the manufacturers as well as the dealers. Mr. Benson told him that whenever he liked to take proceedings against the manufacturer he would render him all the assistance in his power, but the defendant must pay a fine of 10s. and 12s. 6d. costs.

At the Tunstall police court, Mr. Robert Lloyd, grocer and provision dealer, was summoned under the Food and Drugs' Act, for selling adulterated oatmeal. The oatmeal was purchased by William Giffard, an assistant to the inspector, who handed it to Mr. Jones, the county analyst. Mr. Jones certified that the article contained 15 per cent. of barley-meal. The defendant's reply to the charge was that the oatmeal was precisely the same as he had purchased it. A fine of 1s. and costs was imposed. The defendant was told from the Bench that he had his remedy against the party who supplied him with the article.

MARYLEBONE.—MILK ADULTERATION.—John Turney, milk dealer, was summoned by one of the sanitary inspectors of St. Pancras, for selling milk adulterated with water. The certificate of Dr. Stephenson, the public analyst for St. Pancras, showed that the milk was adulterated with 8 per cent. of added water, and was deficient in butter fat. The defendant said he sold the milk as he received it. Mr. Cooke observed that the percentage of water was very small, but as the defendant sold adulterated for pure milk, he must be held liable. He must pay a fine of 2s 6d. and 2s. costs.

Simon Ebben was summoned for a similar offence, the quantity of added water being 16 per cent. The defence was that the milk was sold as bought. Mr. Cooke fined the defendant 20s. and costs.

BELFAST.—ADULTERATED MILK.—Milliam Holden, farmer, was summoned by William John Anderson, sub-sanitary officer, on a charge of selling butter-milk adulterated with 28·48 parts of water. The offence was proved, and defendant was fined 20s. and costs. Defendant, on hearing the sentence of the Court, remarked that it was not justice, whereupon Mr. O'Donnell committed him for contempt of Court. Defendant then expressed his sorrow for having made use of the words in question, and his worship did not enforce the order.—Ann Jane Carlile was also summoned by Mr. Anderson for selling adulterated sweetmilk. A certificate was produced from Professor Hodges, borough analyst, stating that there was 34·27 per cent. added water in the sample. Defendant was fined £5 and costs.

At Guildford Borough Bench, before the Mayor, Christopher Wrist, grocer, High Street, was charged with having sold a quarter of a pound of cocoa which was not of the nature and quality of the article demanded by the purchaser. Defendant pleaded "Not guilty." Police Constable Butcher said that on July 27, he went to the shop of the defendant, where he purchased a quarter of a pound each of cocoa and coffee, and half a pound of butter, for which he paid 1s. 2½d. He told defendant that he was going to have the goods analysed, and that if he chose he might retain one-third.

Defendant replied that he did not care to do that, but that the coffee was not pure. Mr. Superintendent Law said he received the articles named from the last witness on July 27. On the 31st of that month he handed them to the borough analyst at Southampton, and he now submitted his certificate. The Clerk read the certificate, which stated that the cocoa contained 30 per cent. of starch and sugar. Defendant handed in a letter from Messrs. Epps and Co., stating that the label on the paper in which the cocoa was wrapped contained all that was necessary to comply with the requirements of the Act. The Mayor, having looked at the label, said it represented a true statement of the article, and if the analysis was found to be correct, the purchaser knew at the time what he was purchasing. Mr. Law: I take it that there was a label of this kind upon the article purchased, but I maintain that it is not sufficient, for the officer went into the shop and asked for a quarter of a pound of cocoa. There was no mention made as to a mixture. The Mayor: Was it supplied in a packet similar to this (holding up one of Epps's packets)? Mr. Law: I maintain that when a person sells an article of that kind he must call the attention of the purchaser to the fact that it is mixed with some foreign substance. No person would think of reading the whole of that printed matter on the lable before he purchased. The Mayor: Then what's the use of the label? Mr. Law: I maintain that it is worthless. The Mayor: The purchaser has full knowledge of the nature of the article purchased by the label attached to it. Mr. Law: The purchaser's attention must be called to the fact that it is not genuine. There being a number of other cases, it was decided to proceed with the remainder before giving a decision.——Mr. John Fulk, grocer, Woodbridge Road, was similarly charged with having sold a quarter of a pound of cocoa. Defendant pleaded "Not guilty," and Mr. G. White appeared on his behalf. Police constable Butcher said that on July 27th he purchased from the defendant a quarter of a pound each of coffee and cocoa, and half a pound of butter, for which he paid 1s. and 2d. Mr. White suggested that, as there was another charge against defendant, he would like the Bench to hear them separately, so that the one would not prejudice the other. Mr. Law: The articles, the coffee and the cocoa, were obtained at one and the same time. The Mayor: The witness can give evidence of that I think. Mr. White: Do you mean that you will hear both together? The Mayor: Yes. Mr. White: They are separate and distinct cases, and I object, on behalf of my client, to have them heard together. It was decided to hear the case of the cocoa first, and the constable stated that he handed the articles he had bought to Mr. Law. Cross-examined by Mr. White, he said that it was on a Saturday when he went to defendant's shop. He was in plain clothes at the time. Defendant was the person who served him. He would swear that. Mr. White asked witness a number of minor questions, and the Mayor inquired if they were all necessary; they had got the fact that the constable bought the cocoa. Mr. White replied that he was conducting his case properly and fully, and he had no intention of occupying the time of the Court unnecessarily, but he had an object in view in asking the questions he had done. There had been a mistake made in the last case—the certificate was dated two days before the analyst received the articles—and he wished to conduct this case closely. Witness resumed: He first asked for cocoa, and afterwards for flake cocoa. Mr. White asked for the production of the sample sold. Mr. Law handed to Mr. White a packet, which he said contained the cocoa that the constable purchased at defendant's shop. On Mr. White opening it, and showing the contents to the constable, the latter swore that it was not what he bought from defendant. Mr. Law was about to make an explanation, when Mr. White said he had no right to interfere. There was a witness under cross-examination, and until that was completed no other person had a right to interfere in the case. Mr. Law: It is to your own advantage what I was going to say. Mr. White: I want the proper cocoa produced. If this is not it, and the policeman swears that it is not, where is it? Mr. Law: This is the cocoa that was obtained from Mr. Fulk. Mr. White: Well, your witness distinctly states that it is not. The Mayor: The question is, is that the article that he bought and took to Mr. Law? Mr. White: He says it is not. Police constable Butcher, in reply to the Mayor, said the cocoa produced was not the same as he bought from Mr. Fulk. The Mayor: Mr. Law says that is the article you brought him. Mr. Law: It is quite clear that it is the article bought from Mr. Fulk. There is a mistake in the certificate of the analysis, which is dated July 29, whereas I handed the articles to him on July 31. Mr. White: That's the reason I have in addressing myself more particularly to the details in this case. Mr. Law: The certificates are all wrongly dated. No rock cocoa has been returned adulterated. The certificate states that this is rock cocoa. A Voice: Then he doesn't know his business. Mr. White: There has been some mistake somewhere, and one thing I know is that we have not the right article here. The Mayor: I think this case had better be dismissed, at any rate. Nothing can be done with the analysis dated wrongly. Mr. Law: I shall ask that the whole of the cases be dismissed. The analyst has made a great mistake in dating his certificates. I cannot possibly, under the circumstances, go on with the cases. I took the articles myself and handed them to him personally on July 31. The cases were then dismissed, and Mr. Charles Seymour was informed that the summons against him would be withdrawn. Mr. White was making some *sotto voce* observations to the Bench prior to retiring, when Mr. Law observed that the police were only doing their duty. Mr. White remarked that if they had gone far enough into the case the Bench would have seen that the constable had been telling nothing but falsehoods from beginning to end. The Mayor said they could not allow such remarks. The matter then dropped.

At Greenwich police court, on Thomas Clark, cowkeeper, Lewisham, appeared to a summons before Mr. Slade, at the instance of the Lewisham District Board of Works, charging him with selling as milk an article adulterated. The case had been twice before the court, when evidence was given that a man named Robinson was engaged by the appointed inspector under the Act to purchase a pint of milk at defendant's premises, and that on asking for such quantity and being served he tendered a three-penny piece, and received a penny change from defendant's wife. The inspector entered the place of business during this transaction, and said the milk was bought for analysis, when the defendant, who was in another part of the premises, entered the place of sale, and the wife of defendant went and brought a board, the back of which only could be seen in the place of sale, and the front only by passing under a porch. The board in question bore painted notices that pure milk was sold at 5d. a quart, and milk at 4d. with 20 per cent. of water, and this had been certified to exist by Mr. Heisch, analyst to the Board. On the part of the defendant it was stated about three years ago he was summoned, and fined 20s. at this court for a like offence by Mr. Balguy. At that time the defendant had exhibited the notice board over the door of the saleroom, and the magistrate suggested, from explanations given, that more publicity should be given. This has been since followed out, but it was asserted on the part of the prosecution that the sight of the notice board was obstructed by the porch. To settle this disputed point, it was arranged that Mr. Slade, the magistrate before whom the present case had been brought, should visit the premises in question. Mr. Slade now stated that he had viewed the premises on the previous day with the chief clerk, and he confessed that in entering the porch he should not have seen the board unless it had been pointed out to him. The question before him to decide was if sufficient publicity was given. The price at which the analysed milk had been sold, at 4d. per quart, had nothing to do with the case, as at various dairies pure milk was sold at that price. In considering his judgment he had to look to the poor and illiterate persons who would go to the dairy for small quantities of milk for their infants, not being able to see or read the notice if seen, and again he had to protect a tradesman who did all he thought he could do. The defendant had evidently followed out what was suggested at the hearing of the former case, but that was not sufficient and therefore he should only impose a fine of 10s. and 5s. costs.—Mr. Edwards, solicitor to the Board, said that the defendant having been fined 20s. previously, the fine ought to be increased, the full penalty being £20, but Mr. Slade would not alter his decision.

At the Southwark police court, Mr. Griffith Jones, grocer, carrying on business at 94, Spa Road, Bermondsey, was summoned by Mr. Thomas, the inspector appointed by the Bermondsey Vestry, for selling as prime butter a compound containing 80 per cent. of foreign fat. Mr. Thomas said that on June 13 last he saw a placard in the defendant's window on which was written in large letters, "Prime Butter, One Shilling a Pound." In consequence of that he sent his man into the shop for one pound. As soon as the assistant had served the butter, witness took it and divided it into three portions, telling the assistant he was going to have one portion analysed. Witness took it to Dr. Muter, who certified that there was not a particle of butter in it; that it was a compound of animal fat, manufactured to resemble butter, but not injurious to health. Mr. Benson did not think that prime butter, or any sort of butter, could be had for 1s. per pound. Mr. Edwin was positive that it could not, and the inspector must have known it. The compound in question was largely imported from France, and was highly nutritious. His client bought it from a large firm at Greenwich, at 10d. a pound, and sold it for 1s., and when it was sold the wrapper was generally stamped "compound"; but, by some mistake, the assistant forgot to stamp the wrapper. His client had promised for the future to placard it "butterine." Mr. Benson observed that it was a fraud upon the public to sell as "prime butter" a compound not containing a particle of butter; but as the defendant had promised not to sell the compound again as butter, he should inflict only a small fine of 5s., and 12s. 6d. costs.

Mr. Joseph Hughes, grocer, 28, St. James's road, Bermondsey, was fined 2s. 6d., and 12s. 6d. costs, for selling as pure mustard a mixture containing 50 per cent. of turmeric, flour, and starch.

At Sheffield, Mr. William Sheldon, grocer, was summoned for unlawfully selling two ounces of sweet spirits of nitre which was not of the nature, substance, and quality of the article demanded. Mr. A. H. Allen sent a certificate which stated that the sample was almost destitute of the real nitrous ether, which formed the most important constituent of "sweet spirits of nitre" and "spirit of nitrous ether" of good quality. The sample had not been watered. As a remedy it was useless. Mr. Allen appended to the certificate a statement that sweet spirits of nitre gradually deteriorated from decomposition and evaporation of the nitrous ether contained in it. In undiluted specimens this change occured very slowly, extending over many months, and was rarely complete. Defendant stated that he sold the nitre precisely as he bought it from a Sheffield chemist, who declared it to be of good quality. Edwin Wiles, Mitchell Street, the chemist from whom the nitre was purchased, said it was entirely undiluted at his place. He bought it from a respectable house in York. The magistrates imposed a fine of £2 and costs, pointing out to defendant that, as regarded the present case, it did not matter in what state it was when he bought it. If, however, he sold it under quality, he was liable to a penalty of £20.

At the West Bromwich police court, Mr. Henry Dabbs, grocer, Hunter's Lane, West Bromwich, was summoned for selling adulterated coffee. Richard Foy, assistant to Mr. J. G. Horden, inspector under the Sale of Food and Drugs Act for the district of South Staffordshire, proved to visiting the defendant's shop and asking for two ounces of coffee, and upon being supplied he divided it into three parts, and informed defendant that he was going to have it analysed. He gave the defendant one part, Mr. Horden the other, and sent the third to Mr. Jones, the county analyst; and a certificate had been received that the coffee was adulterated with 57 per cent. of chicory. The Bench commented strongly upon the practice of selling adulterated goods, and fined the defendant 40s. and costs, or in default six weeks' imprisonment.

Adulterated Mustard at Wednesbury.—Edward Wardman, of King's Hall, Wednesbury, was summoned for selling adulterated mustard. Foy, assistant to Mr. Horden, purchased 2oz. of mustard at the defendant's shop, and on a portion of it being analysed by Mr. Jones, it was found to contain 64 per cent. of mustard and 36 per cent. of wheat flour. Defendant, who said he never sold genuine mustard, was fined 2s. 6d. and costs.

Heavy Fines for Adulteration.—Messrs. J. Hughes, J. Melter, and F. Marshall, dairymen, of Camberwell, and Charles Howe, C. Radliffe, T. Williams, and E. Stills, of Brixton, were summoned at Lambeth Police Court, by direction of the respective parochial authorities, for selling adulterated milk to the inspectors. Evidence was given as to the purchase of milk, and upon examination it was found in each case to be adulterated with water. For the defence it was urged that the milk had been purchased in the country, and that it was sold as it was received. The magistrate, in deciding the cases, said the milk, as stated, might have come from the country in an adulterated condition, but if parties like defendants neglected to protect themselves by having a warranty, they must put up with the consequences. Such a system was an important matter for customers, and he considered it useless to inflict small penalties. He should order each of them to pay a penalty of £10 and costs, with the exception of Howe and Williams whom he ordered to pay £5 and costs.

Assaulting an Inspector.—Mrs. Helen Evans, of 38, Dartmouth Street, Westminster, was summoned for selling milk not of the nature and substance demanded by the purchaser. She was also summoned for assaulting the inspector while in the execution of his duty. Mr. Warrington Rogers prosecuted for the Westminster District Board, and Mr. W. Wonton Smyth defended. It appeared from the evidence that the inspector sent his son into the defendant's shop on 30th June, and purchased a pint and a half of milk for which he paid 3½d. After the purchase was completed, the inspector himself walked into the shop, and said the sample obtained was for analysis. The defendant said she knew it was wrong, and begged him to give it her back, but he told her that he was bound to do his duty. She then came from the other side of the counter and endeavoured to upset the milk. Having partially succeeded in doing this, she struck him on the head and face and kicked him, without, however, occasioning him any serious hurt. Mr. Rogers put in the certificate of Dr. Dupré the analyst, showing the adulteration to be to the extent of 40 per cent. Five years ago the defendant was convicted at this court for an adulteration of over 80 per cent. of water, and fined £10 by the late Mr. Arnold. The defence was that the milk was paid for at the rate of fourpence a quart, and, inasmuch as a notice was put up stating that this quality was adulterated, the defendant was not liable, as it had been recently held by the Queen's Bench in the case of a publican selling diluted spirits that the notice placed about the premises were a sufficient protection. Mr Smyth also submitted that the milk was not sold "to the prejudice of the purchaser," as the inspector had almost admitted that he did not expect to get pure milk at this particular shop. The defendant admitted that the notice she relied on was covered with the shutters, as the shop was partially closed, it being Sunday. The magistrate thought it a very bad case, and fined the defendant £5 for the adulteration, and 20s. for assaulting the inspector.

NOTES OF THE MONTH.

The *Chemist and Druggist* has, we must admit, got some good ground of complaint in the fact that in the quarterly reports of some analysts such expressions are found as that "two samples of drugs were found entirely wanting of their principal ingredients"; "five samples, three adulterated"; and so on, while no prosecution has followed to test the correctness of these statements. We decidedly agree that were the analysts the prosecutors no articles should appear as adulterated in the quarterly reports unless the

cases had been fully taken before the court. Our contemporary, however, don't remember that it sometimes happens that, for occult reasons only known to themselves, a local authority will not institute a prosecution even when the article is found bad. In such a case the analyst has no option, and he cannot withdraw the mention of the case from his quarterly report. Setting aside disputed questions of nonconformity to recognised strengths, the only real cases of absolute admixture of drugs that ever came under our notice were one of a sample of powdered jalap containing linseed flour and one of sulphate of quinine containing more than 20 per cent. of the other cinchona alkaloids. The former article was, it turned out, purchased not by a chemist but at a small oil shop, and notwithstanding the certificate the authorities declined to prosecute on the ground that the oilman, not understanding drugs, knew no better! Doubtless the case afterwards appeared in the quarterly report, but what could the analyst do to prevent it? The latter case certainly should have been made the ground of prosecution. This appears just one of the points to be considered in any amendment of the Act, and the *Chemist and Druggist* does well to record it, only do not let the blame be thrown on the analysts personally for what they cannot help. If the Government would give to pharmacists an absolute monopoly of the sale of all drugs—a monopoly to which as men of education they are now as much entitled as their German compeers, and in return insist that nothing should be sold except in accordance with a definitely recognised standard of purity, &c.—it would put an end to much trouble and misconception.

On the other hand some authorities will rush blindfold into prosecutions on matters which never ought to be taken into court. An analyst is often snubbed when he makes the remark on his certificate that such and such a result does not give a good ground for proceedings, and is told plainly to mind his own business and leave them to judge. The result is that such really trivial cases as the recent slight deficiency in the alcoholic strength of a sample of tincture of jalap are brought into court. Our view is that in such a difficulty the analyst might address a letter to the inspector, saying that if upon his opinion on oath he would state that he did not consider the deficiency of any real importance. If then the prosecution was brought the analyst could publicly wash his hands of the whole affair. The only difficulty would be when his re-election came on. And if any Board could be found to object to such a letter we say—let them.

An interesting case at Guildford, in which the question of whether a label on Epps's cocoa declaring it to be a mixture, was a sufficient declaration without the vendor actually calling the attention of the purchaser to it, was unfortunately stopped in the middle by it being found that the analyst's certificate of the analysis performed at Southampton was wrongly dated. Such errors would be avoided if an analyst would always make a practice of filling in the heading of his certificate together with the weight of the article while the inspector was actually present. The thing must be done anyway, and to enter into another book and write all the certificates after the analyses have been made wastes time and gives room for error when there are several inspectors at work.

The *Dairyman*, naturally indignant that the publicans should have tried to get a little side wind of favour in the matter of watering their goods, makes the following amusing but perfectly true remarks:—

"It is, however, coming it a little too strong, for these publicans, who it would seem are anxious to compel their customers to be water drinkers to a certain extent, to attempt to get the Act so altered that *they only* shall adulterate with impunity, while all other traders, forsooth, are to be subjected to the pains and penalties deservedly attaching to dishonesty of the description named. The mere fact of these gentlemen desiring to get such a clause interpolated in the Act, plainly indicates that they have a misgiving as to the legality if not morality of supplying gin and water when gin only is asked for, and it is satisfactory to know that they are still in the same uncertain frame of mind, as the Bill, in which the ill-advised amendment was embodied, has been withdrawn, and the Act of 1875 remains in *statu quo*."

And yet, strange to say, the Local Government Board appears to have consented to act as foster father to the publicans' clause. We are sure that this cannot have been done with such careful consideration as Mr. Sclater-Booth bestowed on the original Bill itself.

The Local Government Board is still bestirring itself *re* analysts' appointments, and the Plymouth Town Council has received a gentle hint that it is its duty to protect the interests of its fellow-townsmen by forthwith appointing a public analyst. After such dictation to that august body we fear that the individual appointed will not exactly lie on a bed of roses.

The silly season in the papers has lately had a new feature besides the time-honoured gigantic turnip. Popular science nowadays is everything, and so we have a Mr. J. B. Watson writing to the *Times* as follows:—

"As the fees of the analytical chemist are beyond the means of many, a few simple test papers might be prepared and used for many purposes. Certain cards should be prepared and hung in closets, which, by changing colour, would immediately betray the presence of sewage-gas in the atmosphere. Other papers might be prepared for testing the purity of water or tea, or other articles of daily consumption. The paper for testing water would immediately, should lead be present, betray its existence; the papers for testing tea would betray the presence of copper and so forth. The papers might be prepared in packets and labelled. These test papers would be very inexpensive, and could be used by the most inexperienced with confidence."

So far so good, but why not at once start a company to supply the public with papers dipped in the true *elixir vitæ*, so that simply chewing one every day would make it a matter of indifference what they ate altogether. Perhaps Mr. Watson would object that the real article is as yet unknown, but then is not the same thing true of his "simple test papers?" Until he gives us his formula we fear the "simplicity" would be all on the side of the purchasers. But even this grand idea is not original, because it appeared somewhere in the silly season last year.

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It is requested that when medical men prescribe orange-flower water they should put the word *concentrated* if they want it pure as imported, for it has leaked out at the Conference that some chemists critically examine the prescription, and if they in their wisdom deem that it is added only as a flavouring and not as a sedative they supply it diluted with water one in three. Sailors have a decided objection to "three water grog," but this wonderful article actually improves by dilution; besides what do patients know about it, and then—look at the extra profit!

One of our contemporaries suggests that licensed victuallers "should imitate the example of dairymen, and apply their trade society funds to prosecute adulterating members of their trade rather than to defending them against the consequences of their equivocal practices." This would be more like the common honesty which trade societies should possess.

RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1878. No.	Name of Patentee.	Title of Patent.	Price.
174	A. E. Healey	Treatment of Paper and Woven Fabrics	6d.
244	J. Livesey and J. Kidd	Production of Combustible Gas	6d.
301	W. M. Brown	Evaporation of Cane Juice	6d.
317	L. Peroni	Construction of glass Tubes for Thermometers	6d.
372	F. L. H. Danchell	Refining and Decolourizing Oils Spirits and Syrups	4d.
443	J. Lee	Manufacture of Gas from Wood Peat, &c.	2d.
449	J. H. Johnson	Treating Sugar	6d.
456	J. Johnson	Manufacture of Dextrine and Glucose	2d.
498	J. Wadsworth	Apparatus for Evaporating and Drying Sewage	6d.
500	J. Holloway	Sulphur	4d.
511	H. Baggeley	Treatment of Sewage	4d.
519	A. S. L. Leonhardt	Recovering Arsenic from the Residue of Magenta Colours	6d.
522	W. Young	Manufacture of Gas	8d.
581	R. Punshon	Treatment of Sewage	2d.
630	A. M. Clark	Dyeing and Printing with Derivatives of Aniline	4d.
646	E. Field	Treating Fatty and Oily Matters	6d.
647	E. Field	Saccharification of Amylaceous Matter	4d.
682	A. Fryer	Treating the Refuse of Towns	6d.
714	A. M. Clark	Decolorizing Solid and Liquid Matters	2d.
729	W. P. Wilson	Purification of Gas	8d.
771	E. P. Alexander	Manufacture of Sulphate of Alumina	4d.
786	J. H. Johnson	Production of Colouring Matters for Dyeing and Printing	4d.
1524	C. D. Abel	Manufacture of Loaf Sugar	8d.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Medical Record; The Miller; The Anti-Adulteration Review; Journal of Applied Science; The Boston Journal of Chemistry; The Dairyman; The American Dairyman; The Practitioner; G. Jones, on Violet Powder.

THE ANALYST.

NOVEMBER, 1878.

A CURIOUS CASE OF POISONING BY MOULDY BREAD.

By Alfred H. Allen, F.C.S.

I have recently had the investigation of a very curious case of poisoning at Barnsley, and as the circumstances fortunately allowed of a very complete examination being made, and the case has several features of special interest, the following description may not be without value :—

At a cheap eating-house in Barnsley, kept by a Mr. Thresh, the cook made two bread puddings of the scraps of bread left from making toast, sandwiches, &c. These scraps had been accumulating for some weeks. After soaking the bread over night in cold water, she added milk, sugar, eggs, currants, and nutmeg, and then baked the puddings in separate ovens. The cook herself, the proprietor of the eating-house, the waiter, and a customer partook of one of the puddings,—distinguished as No. 1 in the evidence. The rest of it was sent to Thresh's own house, and four of his children partook of it. Of the eight persons who eat of No. 1 pudding, everyone was seized with violent purging, vomiting, and other symptoms of irritant poisoning. Their pulses were very rapid, but none of them had bloody motions. After thirty-six hours, Emma Thresh, a delicate child of three, subject to diarrhœa, died, and a week after eating the pudding, Mason, the waiter, also died. He was a very weakly man, given to drink, and was often purged ten and twelve times in an afternoon. Hence, his symptoms did not at first excite suspicion, especially as he did not vomit till the second day.

The other pudding was only eaten by one person, who did not take much, and did not suffer in any way.

The remainders of both puddings, the viscera of the two deceased persons, and the rest of the currants, nutmeg, and sugar used in making the puddings, and the spoon used in helping them were all submitted to me.

The medical man who made the postmortem examinations, having suspected arsenic or copper, my attention was first directed to metallic poisons, of which, however, no trace could be detected. The search was not limited to the sulphuretted hydrogen metals, but zinc, chromium, and barium were also carefully looked for.

I may take this opportunity of saying, that when a starchy or saccharine preparation like bread pudding is to be examined for metallic poisons, Fresenius' method of destroying organic matter (by treating the substance with hydrochloric acid and potassium chlorate) is very ill adapted for the purpose. A clear yellow liquid is readily obtained, but the colour is much darkened on heating, or on treatment with sodium sulphite, and on prolonged passing of sulphuretted hydrogen yellow or brownish organic matter is thrown down, which contaminates any true metallic sulphide, and causes other inconvenience. A far better plan, in my opinion, is to exhaust the starchy matters with cold dilute hydrochloric or sulphuric acid, adding alcohol, if necessary, to facilitate filtration. The solution so obtained may be conveniently tested for metals, alkaloids, oxalic acid, &c. The insoluble portion should then be treated with strong nitric acid and a little potassium

nitrate, evaporated cautiously to dryness, and ignited. Non-volatile metals can then be readily detected in the residue. In the case of the puddings in question, both this method and that of Fresenius'* were employed, with entirely negative results.

A search for phosphorus and cantharides was not omitted, and I also made a careful examination for alkaloids in the liquid obtained by treating No. 1 pudding with sulphuric acid and alcohol, but without result. Nor had the extract left on evaporating this liquid any bitter taste, or any poisonous effect on a mouse fed with it.

On arriving at this point I was much puzzled, and still more so when I found that No. 1 pudding, which had poisoned eight people, did not even purge a six weeks' old puppy which I fed on it for two whole days. Still the evidence that No. 1 pudding really poisoned the people was sufficiently strong to *hang it.*

At this stage I wrote to several friends to ask if they could suggest any explanation of the facts. I received in reply a letter from Dr. Tidy, suggesting *ergot* as a probable cause, but admitting that the empty bladder of Mason was not in accordance with the usual symptoms of ergot poisoning. One of the medical men subsequently pointed out that the extremely rapid pulse of the poisoned persons was opposed to the usual effects of ergot.

I examined the pudding under the microscope for ergot, but could find none. Nor had it any violet tint. Nor did the flour of which the bread supplied to the eating house was said to have been made contain any detectable trace of ergot when examined microscopically and chemically. The rye-meal of the same baker contained only a doubtful trace of ergot.

On treating No. 1 pudding with cold solution of soda an unmistakable smell of herrings was observed. After a time the mixture acquired a brilliant lake-red colour, which increased in intensity and was very permanent. The colour was very striking and characteristic, but not of the same shade as the violet-red I obtained from a bread pudding to which I had purposely added ergot. No. 2 pudding gave the same reactions as No. 1, but far less distinctly.

The lake-red colour with soda was producible throughout the mass of the pudding, and not merely on the surface. Portions of the pudding which had become visibly mouldy did *not* give the lake-red reaction, nor did a bread pudding prepared from pure materials for the purpose of comparison give any ergotoïd reaction.

Under the microscope, abundance of *mycelium* threads and other structures were observable.

From these results it appears that the red colour and trimethylamine odour observed on treating ergot with an alkali are not peculiar to that fungus, as has been supposed hitherto, but are obtainable from other sources. That the substance producing these reactions is a fungus there could be little doubt, and it is probable that it contains the same poisonous principle as ergot. In the present unsatisfactory state of the chemistry of ergot I thought it useless to attempt to isolate or identify the active principle.

*The best way of applying Fresenius' process to animal matters is to distil the substance with pure fuming hydrochloric acid, collecting the distillate in a little water. Arsenic, and probably antimony, will pass over, and can readily be detected in the distillate. The residue in the flask or retort is diluted with hot water, and submitted to the action of the gas given off on treating chlorate of potassium with strong hydrochloric acid. By proceeding in this manner, all the oxidising effect of chlorine peroxide is obtained without the objectionable introduction of solid matters. In this process, the animal matters are completely destroyed, and the poison dissolved without possibility of loss, and without the introduction of any foreign matter but compounds of chlorine.

I believe I have now obtained absolute proof that a body giving the ergotoïd reactions with soda is really a poisonous fungus, for I have reproduced it on a slice of bread soaked in milk and sugar and inoculated at one end with No. 1 pudding. In forty-eight hours the lake-red reaction with soda was obtainable from portions of the bread several inches removed from the pudding, and this distance was increased as time went on. Finally a portion of the bread far removed from the pudding produced violent purging on a mouse which was fed with it.

This last experiment was made subsequently to the verdict of the jury, which was that the deceased persons " Died from eating unwholesome pudding, but how and by what means such pudding became unwholesome there is no sufficient evidence to show." Everyone connected with the case whose opinion could be considered of value felt convinced that the cause of the disaster was the condition of the bread, but after the verdict I learnt that some of the jury could not conceive that a "mould" invisible to ordinary observation could be poisonous, and the cook did not notice any mould on the bread of which she made the pudding!

I may add that the poisonous pudding had no sign of crust on it, but was "sloppy," and of the consistency of bread and milk. The oven in which it was baked was a notoriously slow one. The separate lumps of bread were clearly distinguishable, and the heat had not been sufficient to burst, or in many cases to alter, the starch corpuscles.

The presence of a fungus, poisonous at a particular stage of its growth, would account for the pudding poisoning the original partakers, and yet being inert when tried on the puppy ten days afterwards. It might still be detectable by chemical reactions (like old ergot) and be capable of reproduction, as it seems to have been in the slice of bread.

There was no suspicion of malice on the part of anyone, or even of a trick having been played, and Thresh himself attributes the poisonous effects simply to "sour food."

On searching for recorded cases of poisoning by mouldy bread (as distinguished from ergotized bread) I found several instances in which very similar effects had been observed. In a case described in Von Boeck's new work on poisons, three persons were violently ill, and one, a child of a few years of age, died.

NOTE ON A CURIOUS CASE OF DANGEROUS MILK.

By Dr. John Muter, F.C.S.

I have been lately consulted by a gentleman, whose family suffered an attack of sickness and purging after partaking of the usual morning's milk, with the view of, if possible, tracing the cause of the attack. The quantity saved was unfortunately very small, and was delivered to me in the can in which it came, but a larger amount of the same milk, which had been boiled, was also submitted. The latter enabled me to make a careful search for poisons, but with a negative result, and (after allowing for the probable concentration of the milk by boiling) showed that little or no water had been added. On opening the can, I was at once struck by the strikingly foul smell which emanated from it, and on putting the milk under the microscope, although I found no pus, casts, blood or other appearances indicating disease, I noticed some bodies which appeared to be fungoid cells. I then turned my attention to the can, and found that the smell, although partly communicated to the milk, really existed chiefly in that vessel. On partially washing

the can I obtained decided appearances of fungoid growths and some bacteria adhering to the joints, which were entirely filled by a solid mass of decomposing milk constituents. I at once concluded that the milk had been rendered poisonous by being placed in this dirty can, which had quickly communicated its septic properties to the contents; and I reported accordingly. This shows that a poison, probably of a fungoid nature, can form in milk vessels when they have had the milk hardening in them, and are only given a slight perfunctory rinse. Our publicans take a pride in the perfect brightness of their cans both inside and out, and why should not our milkmen also avail themselves of a little sand and "elbow grease." Unfortunately the milk can is too often a dull, dirty, and unscrubbed receptacle, capable of conveying, as above shown, a dangerous fermentive poison. I, for one, will insist on having my milk in brightly-scrubbed cans (both outside and inside), and I advise the public to do likewise, or change their purveyor. I intend trying to obtain some more of the curious growth I saw, and hope to be able to describe it more minutely at a future date. I ought to say that the odour of the can was not at all that of simply stale milk, but something indescribably putrid and offensive.

ON THE NITROGEN COMPOUNDS PRESENT IN THE CEREALS.

By G. W. Wigner, F.C.S.

(*Third Paper.*)

In the previous notes on this subject I omitted to notice that the determinations of nitrogen had all been made by the soda-lime process. When I commenced the investigation I was of opinion that the results obtained by this process were sufficiently correct for the determination of such nitrogenous substances as are met with in the cereals, provided of course that the proper precautions were taken, and especially that the quantity of the grain burnt was not too large. Working in this way on 10 or 15 grains of the sample, I had found that with proper care the proportion of gluten shown by this process varied as the maximum error less than 0·2 in different analyses of the same sample. But on carrying these investigations further I am convinced that there are certain disturbing circumstances due to the samples themselves which render the results liable to a greater error than this. No alteration in the mode of procedure in the analysis is sufficient to account for some of the differences found, and I cannot at present trace any relation between the non-coagulable constituents and the irregular results, but the fact remains that I have found certain samples which show in some cases nearly one per cent. more or less albuminous matters by the soda-lime process than I should have expected them to do, and yet while repeats give nearly identical results, the percentages found differed materially from those given by the absolute nitrogen process. It seems to me probable that some of the non-coagulable constituents may be the cause of this disturbing action, but at present all I can say is that the residues which have been coagulated by acid give results which are more uniformly correct than those which are obtained from the original meal or flour. It may be possible for me on a future occasion to point out the exact differences in the results of every sample, but for the present I give the results by soda-lime process only.

Before passing to the results obtained from the analysis of the flour it will be convenient if I give some more general particulars as to these samples. They were, as I have said before, representative not average ones, and were selected from soils of different kinds, and from good and bad crops. Taking the weight per bushel as the standard of comparison most generally referred to, I have the following figures, for which I am again indebted to my friend, Professor Tanner. I also give in another column a determination of the actual weight of 100 grains or kernels of the sample. These weights were taken in such a way that I think the results are quite correct, and they may furnish some clue to the variations found between the different samples. I also give the specific gravity of the whole grain determined by direct weighing.

Mark.	Weight in lbs. per bushel.	Specific gravity of whole grain.	Weight in grains of 100 average corns of whole grain.
A	66	1·30	69·2
B	61	1·26	65·5
C	67	1·33	66·2
D	66	1·31	60·4
E	57	1·24	44·1
F	55½	1·28	63·8
G	66	1·39	67·0
H	63	1·31	78·1
J	63	1·28	81·2
K	64	1·27	81·8
L	63	1·25	80·9
M	54	1·24	46·1
N	62	1·27	63·2
O	64	1·30	63·7
P	64	1·35	55·0

The weight of the corns will be seen to vary greatly, namely, from 44·1 grains per 100 to 81·8 grains per 100, the average of the whole is 65·75 grains as the weight of 100 corns.

As a further guide in considering the results it may be noted that Professor Tanner has kindly informed me that sample L was a very large crop, and sample E was a small crop; sample A was a very fine white wheat; sample B was harvested during very bad weather; sample J was grown on clay land after clover, and sample H on gravelly soil after clover.

As I have already referred to the results obtained from the whole meal and bran, I have next to consider those obtained from the samples of flour. It is necessary to bear in mind that these samples of flour were made by grinding the wheat by hand in a coffee mill, and dressing through a sieve with 80 holes per linear inch. The result of this mode of grinding and dressing is to mix the flour with pulverized bran to a much larger extent than is the case with commercial samples of flour which have been ground between stones and dressed through silk. The soda-lime combustions of these samples were all made on small quantities of flour, as I found the results obtained from say 10 grains more uniform than those obtained when larger quantities were taken. Slow combustion seemed to give the highest and most consistent results, and was therefore adopted, so that most of the samples were more than an hour and a half in the furnace, which is Griffin's gas. The samples were coagulated by carbolic acid, acidified with a few drops of metaphosphoric acid solution, and the filtrates saved for subsequent examination.

The following were the results obtained, the nitrogenous constituents being calculated as before by multiplying the nitrogen found by 6·33; the results are given in percentages:—

FLOUR.

Mark.	Total nitrogenous matters.	Nitrogenous matter, coagulated by carbolic acid.	Nitrogenous matter not coagulated.	Percentage of true gluten, calculated on total nitrogenous matters.
A	12·97	11·64	1·33	89·7
B	7·97	7·32	·65	91·8
C	7·85	7·60	·25	97·8
D	7·60	7·34	·26	96·6
E	8·86	8·10	·76	91·4
F	8·73	8·10	·63	92·8
.56 X G	9·43	7·59	1·84	80·5
H	8·86	8·35	·51	94·2
J	9·49	6·70	2·79	70·6
K	8·41	7·72	·69	91·8
L	7·78	6·73	1·05	86·5
M	11·28	10·12	1·16	89·6
N	8·40	7·88	·52	93·8
O	9·18	8·57	·61	93·4
P	12·13	11·13	1·00	92·0

The most discordant results are those shown by the J samples. Now on referring to THE ANALYST, pages 305 and 306, it will be seen that this sample of wheat showed in the whole meal the smallest but one percentage ratio between the true and non-coagulable albuminoids, namely 73·7 per cent., and that the bran from it showed a high ratio, namely 88·0 per cent. The proportion of flour obtained from this sample was 82·5 per cent. leaving bran 17·5 per cent. Now multiplying the results up we have:—

Bran	17·5 × 88·0 per cent.	=	15·40 per cent.
Flour	82·5 × 70·6 „	=	58·24 „
	Total		73·64 „
	Found in whole meal ...		73·70 „

This shows very good agreement in the results *inter se*, much better than prevails in some other cases. In the G sample, which shows the next smallest percentage, the figures worked out as above show by calculation from the bran and flour 83·3 per cent. of the nitrogenous matter present as true gluten, and the whole meal result was 83·9 per cent. In the case of the highest percentage the bran sample of C, after washing with carbolic acid, was spoilt, but the whole meal result was also one of the highest.

It will be more useful to show these results next in another form, putting side by side the results obtained from the whole meal, bran and flour.

PERCENTAGE OF TRUE GLUTEN CALCULATED ON THE TOTAL NITROGENOUS CONSTITUENTS.

Mark.	Whole meal.	Bran.	Flour.
A	87·9	42·4	89·7
B	80·9	59·6	91·8
C	92·5	—	97·8
D	91·9	40·8	96·6
E	65·9	76·6	91·4
F	76·4	86·8	92·8
G	83·9	89·8	80·5
H	81·0	70·1	94·2
J	73·7	88·0	70·6
K	79·4	64·3	91·8
L	74·0	66·4	86·5
M	90·0	78·8	89·6
N	95·3	81·5	93·8
O	76·2	52·1	93·4
P	79·8	55·7	92·0

It will be seen that the percentage ratio of true gluten found in samples M and N* is greater in the whole meal than in either the bran or flour when sifted. It seems impossible to explain this result on any other supposition than the uncertainty of the soda-lime process already referred to.

Samples G and J give a higher ratio of true gluten in the bran than in the flour, and they are the only samples which do so. They have already been referred to.

The average of all these ratios is as follows:—

Whole meal	...	81·9 per cent.
Bran	...	68·1 „
Flour	...	90·2 „

I have in each case determined the nitrogen in the form of nitrates and nitrites in the filtrate from the carbolic acid process. To render these results readily comparable with the previous ones I must now give the percentages of actual nitrogen found by combustion side by side with those found existing as nitrates and nitrites:—

Bran.

Mark.	Total N. by combustion.	Coagulable N. by combustion	Difference.	N. as nitrates and nitrites by aluminium process.	Difference = N. in other forms.
A	2·119	0·900	1·219	0·064	1·255
B	2·147	1·280	0·867	0·021	0·846
C	1·858	—	—	0·017	—
D	1·369	0.560	0·809	0·016	0·793
E	1·173	0·900	0·273	0·055	0·218
F	1·473	1·280	0·193	0·028	0·165
G	1·669	1·500	0·169	0·016	0·153
H	1·738	1·219	0·519	0·037	0·482
J	1·840	1·618	0·222	0·037	0·185
K	1·587	1·020	0·567	0·022	0·545
L	1·775	1·178	0·597	0·022	0·575
M	1·700	1·340	0·360	0·020	0·340
N	1·300	1·059	0·241	0·015	0·226
O	1·460	0·759	0·701	0·015	0·686
P	2·473	1·378	1·095	0·021	1·074

These results show an average of 0·027 per cent. of nitrogen as nitrates and nitrites still unaccounted for, and although there are considerable variations in the samples, the maximum proportion of ·064 per cent. is still only a small one.

Taking the flours in the same way we get the following results:—

Flour.

Mark.	Total N. by combustion.	Coagulable N. by combustion	Difference.	N. as nitrates and nitrites by aluminium process.	Difference = N. in other forms.
A	2·049	1·838	0·211	0·019	0·192
B	1·259	1·156	0·103	0·017	0·086
C	1·240	1·200	0·040	0.022	0·018
D	1·200	1·160	0 040	0·025	0.015
E	1·400	1.279	0·121	0·022	0·099
F	1·378	1·279	0·099	0·018	0·081
G	1·489	1·198	0·291	0·019	0·272
H	1·400	1·318	0·088	0·021	0 067
J	1·500	1·058	0·442	0·022	0·420
K	1·330	1·219	0·111	0·016	0·095
L	1·230	1·063	0·167	0·021	0·146
M	1·781	1·599	0·182	0·017	0·165
N	1·326	1·245	0·081	0·016	0·065
O	1·450	1·354	0·096	0·020	0·076
P	1·915	1·758	0·157	0 018	0·139

* The N sample was from the continuous growth of wheat for 9 years out of 10.

The average of this series shows:—

Nitrogen not coagulated	... ...	0·149 per cent.
Ditto as nitrates and nitrites	... ...	0·019 „
Ditto in other forms	... ...	0·130 „

So that in the case of the flours only about one-eighth part of the nitrogen is accounted for by this determination. The variations here do not seem to show any special law, except that the proportion present is, in nearly every case, less than that found in the corresponding bran.

The net result so far then is that in the bran we have an average of 0·390 per cent. of nitrogen, and in the flours an average of ·130 per cent of nitrogen, which is not present as true gluten or as a nitrogen acid. Part of this quantity is no doubt present as glutin, and it seems probable that another portion may be in a body of the asparagin class. I am carrying this investigation further, but cannot report upon it at present.

My object in taking up this matter was to form a true opinion as to flesh-forming values, and it is quite clear to me that at present it will not do to assume that any nitrogenous bodies other than those coagulated by carbolic acid are really of value. Averaging the samples again I find that the whole meals show an average of 8·09 per cent. of true gluten, and the flours 8·33 per cent., or 0·24 per cent. of real flesh-formers in favour of the flour, and it must be borne in mind that this would have been larger if the bran had been more perfectly separated. I come therefore to the conclusion that the supposed greater feeding power of whole meal is not at present borne out by the facts.

I hope to give shortly a few similar facts as to oats and barley, which, as far as I can judge at present, show similar results.

At a meeting of the Scarborough Town Council, on the 26th October, Mr. James Baynes, jun., was appointed public analyst for that borough. The other candidates were Mr. Thomas Fairley, Leeds; Mr. George Jarmain, Huddersfield; and Dr. Proctor, York.

Mr. Louis Siebold, F.C.S., editor of the "Year-book of Pharmacy," has been appointed Public Analyst for the County of Westmoreland.

Mr. J. Baynes has been appointed public analyst for the Borough of Hanley.

Mr. A. H. Allen has been appointed public analyst for Barnsley.

Dr. Drinkwater, F.C.S., has been appointed Lecturer on Chemistry in the Edinburgh School of Medicine.

Faraday Lecture.—Prof. Wurtz will deliver his lecture "Sur la Constitution de la Matière à l'Etat Gazeux," on Tuesday, November 12th, at half-past eight o'clock p.m., in the Theatre of the Royal Institution. Fellows and visitor's tickets can now be had on application to Mr. Hall.

In consequence of the Chemical Society's Dinner having been fixed for the 13th November, the next meeting of the Society of Public Analysts has been postponed to the 20th November.

Errata.—In Dr. Cameron's paper, on p. 337, third line, the full stop should be after, not before, the *I "well"; and six lines from bottom,* "3 grains" should be "53 grains."

The foll. wing are abstracts of some further papers read before the British Pharmaceutical Conference:—

ON NECTAR IN VARIOUS FLOWERS.

By A. S. Wilson, M.A.

Mr. Wilson reported the proportions of sugar he had found in many flowers, and calculated that in order to obtain 1 kilo. of sugar 7,500,000 distinct flowers must be sucked. As honey contains roughly about 75 per cent. of sugar, a bee has thus to make about two-and-a-half millions of visits in order to collect a pound of honey. It is rather a curious fact that nectar should contain cane sugar, seeing that honey never does, indeed, were a vendor to sell honey containing cane sugar he would probably be prosecuted under the Adulteration Act. A change must, therefore, take place while the sugar is in the bees possession—possibly through the action of the juices with which it comes in contact while in the honey bag, which is an expansion of the œsophagus of the insect. As nectar is acid in its reaction, it is, however, possible that the process of inversion may take place spontaneously.

ON THE DETECTION AND ESTIMATION OF MINERAL OIL.

By W. Thomson, F.R.S.E.

This referred to a process which Mr. Thomson had contrived for detecting mineral oil in animal, vegetable, or fish oils, with which he said it was often mixed to form a lubricating oil. He boiled some of the sample with an alcoholic solution of caustic soda, which converted all the animal, vegetable, or fish oils into soap. This was then mixed with sand and treated and washed with petroleum spirit, and distilled at a temperature under 190° Fahr., which dissolved out the mineral oil, leaving the soap insoluble. The spirit is then distilled off from the spirit solution of mineral oil at a temperature not exceeding 220° Fahr., and the residue of mineral oil weighed and calculated on the weight of the original mixed oil taken.

NITRITE OF AMYL,

By D. B. Dott.

This paper embodied the results of an examination of several samples of nitrite of amyl procured from different makers, with the view of ascertaining the degree of purity of the article in the market. The samples examined had a specific gravity varying from ·864 to ·876, the proper specific gravity being ·877. By a single rectification they gave a yield of 6·7, 11·5, 33·3, 47·5, and 65·0 per cent. respectively, boiling at 90° to 100° C., while a sample prepared by the author in the ordinary way gave 85·0 per cent. One of the samples had an odour quite distinct from that of genuine nitrite of amyl, and produced little effect on the heart's action by the inhalation of its vapour. It will thus be seen that there is a great variation in the quality of the amyl nitrite of different makers, and that some of it is of very inferior quality. The author considers that some standard of purity less rigid than that of the Pharmacopœia ought to be adopted, as it is impossible to prepare a nitrite of amyl boiling constantly at 205° F. Indeed, there seems to be some doubt as to whether that is really the correct boiling point. The process for preparing nitrite of amyl, by passing nitrous acid gas through amylic alcohol is held to be the best, being decidedly preferable to that by the direct action of nitric acid on the alcohol.

THAMES WATER.

By G. W. Wigner, F.C.S.

The following analysis of samples of Thames water, which I have recently made for the Woolwich Board, will probably possess rather more than a passing interest. They show clearly how large a proportion of sea water finds its way up a large tidal river such as the Thames, to a distance of some forty miles from the mouth, and to within about a dozen miles of where it ceases to be tidal. The samples were taken when the river was in slightly more than its average condition of flood. The increase in the proportion of chlorine, as the samples are taken at greater depths from the surface, will be noted as a marked feature in the results. The samples were taken on an ebb tide.

The microscopical results gave the most convincing proof of sewage contamination, as fragments of partially decomposed food and animal fibre and disintegrated paper were found in more than two-thirds of the samples. All of them swarmed with living and dead infusoria and diatoms of many different species.

The samples Nos. 11, 9 and 10 were taken, as nearly as possible, at the spot where the wreck of the "Princess Alice" was found.

TABULAR STATEMENT of Results of Analyses of Samples of Thames Water taken on the 14th of October, 1878. All results expressed in grains per gallon.

Number ...	1	2	3	4	5	6
Place ...	Billingsgate.		Limehouse Reach.		Charlton Pier.	
Time ...	3 p.m.		3.35 p.m.		4.40 p.m.	
Depth ...	Surface	15 ft.	Surface	20 ft.	Surface	20 ft.
Temperature ...	56 deg.	56½ deg.	58 deg.	58 deg.	56½ deg.	56½ deg.
Appearance of Sample ...	Turbid	Turbid	Turbid	Turbid	Turbid	Turbid
Smell ...	Slight	Slight	Slight	Slight	Objectionable	Objectionable
Suspended Matter—Organic Matter ...	1·24	3·01	1·26	1·83	1·58	1·17
„ „ Inorganic ditto ...	6·12	13·33	5·82	6·98	4·91	5·35
Total suspended or sedimentary Matter...	7·36	16·34	7·08	8·81	6·49	6·52
Colour of Filtered Water ...	Yellow brown	Yellow brown	Yellow brown	Yellow brown	Yellow brown	Yellow brown
Dissolved Matter—Organic Matter ...	30·40	35·80	516·00	134·20	361·80	154·00
„ „ Mineral ditto ...	229·40	250·80	476·80	496·00	647·20	686·00
„ „ Total Solid ditto ...	259·80	286·60	992·80	630 20	1009·00	840·00
Chlorine ...	127·98	141·64	273·35	273·35	366·53	388·10
= Chloride of Sodium ...	210·90	233·42	450·45	450·45	604·01	640·87
Anhydrous Sulphuric Acid ...	16·05	17·77	32·19	33·73	43·52	47·13
Nitrogen as free and saline ammonia ...	·0140	·0260	·0440	·0440	·0740	·0700
Ditto as albuminoid (organic) ammonia...	·0100	·0120	·0160	·0180	·0200	·0200
Oxygen absorbed from a standard solution of permanganate of Potash ...	·1700	·2000	·1700	·1550	·1500	·1400

Number	7	8	11	9	10	12
Place	North Woolwich Pier.		Wreck at Powder Magazine.			Northern Outfall
Time	4.45 p.m.			5 p.m.		5.10 p.m.
Depth	Surface	20 ft.	Surface	20 ft.	40 ft.	5 ft.
Temperature	56 deg.	56¾ deg.	55½ deg.	56 deg.	56 deg.	58 deg.'
Appearance of Sample	Turbid	Turbid	Turbid	Turbid	Turbid	Very turbid
Smell	Most objectionable	Sulphuretted hydrogen	Most offensive	Most offensive	Most offensive	Decomposed sewage
Suspended Matter—Organic Matter	·78	·82	1·61	1·06	4·90	6·98
" " Inorganic ditto	5·47	5·96	4·23	4·77	27·42	17·78
Total suspended or sedimentary Matter	6·25	6·78	5·84	5·83	32·32	24·76
Colour of Filtered Water	Yellow brown	Yellow brown	Yellow brown	Brown yellow	Yellow	Deep yellow brown
Dissolved Matter—Organic Matter	151·60	211·20	140·40	212·20	125·20	170·00
" " Mineral ditto	670·20	733·20	723·40	778·60	815·20	692·40
" " Total Solid ditto	821·80	944·40	863·80	990·80	940·40	862·40
Chlorine	383·93	413·83	419·94	442·32	452·26	400·08
= Chloride of Sodium	632·68	681·95	692·02	728·91	745·29	659·29
Anhydrous Sulphuric Acid	45·36	47·47	49·19	52·11	52·60	28·07
Nitrogen as free and saline ammonia	·0620	·0500	·0400	·0600	·0500	·2000
Ditto as albuminoid (organic) ammonia	·0160	·0180	·0160	·0500	·0240	·0620
Oxygen absorbed from a standard solution of permanganate of Potash	·1350	·1650	·0850	·0850	·2195	·2850

Number	13	14	15	17	16	18
Place	Between Northern and Southern Outfalls.		Southern Outfall.	Jenningtree Point.		Gas Works Outfall Oct. 19.
Time	5.20 p.m.		5.30 p.m.	5.40 p.m.		3 p.m.
Depth	Surface	20 ft.	10 ft.	Surface	20 ft.	Surface
Temperature	55 deg.	56 deg.	57 deg.	56 deg.	56½ deg.	...
Appearance of Sample	Turbid	Turbid	Very turbid	Turbid	Turbid	Turbid
Smell	Decomposed sewage	Decomposed sewage	Decomposed sewage excessively strong	Very offensive	Very offensive	Offensive
Suspended Matter—Organic Matter	2·41	5·19	4·70	1·73	6·58	3·62
" " Inorganic ditto	10·11	24·51	12·23	8·87	27·59	9·99
Total suspended or sedimentary Matter	12·52	29·70	16·93	10·60	34·17	13·61
Colour of Filtered Water	Urine yellow	Yellow	Very deep urine yellow	Yellow brown	Urine yellow	Yellow
Dissolved Matter—Organic Matter	156·80	116·60	116·20	164·00	185·00	78.40
" " Mineral ditto	743·00	766·60	587·00	839·80	927·60	367·20
" " Total Solid ditto	899·80	882·60	703·20	1003·80	1112·60	445·60
Chlorine	424·93	447·30	342·93	484·57	536·76	211·23
= Chloride of Sodium	700·24	737·10	565·11	798·52	884·52	348·07
Anhydrous Sulphuric Acid	50·36	49·87	40·60	21·20	16·05	23·34
Nitrogen as free and saline ammonia	·0255	·0315	·1900	·0680	·1400	·1200
Ditto as albuminoid (organic) ammonia	·0070	·0070	·1100	·0160	·0500	·0120
Oxygen absorbed from a standard solution of permanganate of Potash	·1750	·1300	·3650	·1000	·1500	·1675

ANALYSTS' REPORTS.

Dr. Bostock Hill, the Warwickshire analyst, at the recent county sessions presented his quarterly report, in which he stated that he had received twenty-two samples for analysis. All the samples were pure except a specimen of mustard which had been exposed to the weather. Dr. Hill was reappointed county analyst for twelve months.

At the Wilts Quarter Sessions, Dr. Dunkin, the county analyst, presented his report, which stated that a sample of coffee which he tested was not good, there being an undue proportion of husk and chicory, which, however, might have been accidental. Some mustard consisted of two parts of mustard to one of flour and tumeric. The Clerk of the Peace said the report on the whole was favourable.

The report of the county analyst, Mr. W. W. Stoddart, was presented to the Somerset Quarter Sessions. He said during the quarter he had analysed 370 samples of food, two of which were brought by the public and the others by superintendents of the police. He had analysed 188 samples of beer, the result being that although the beers had varied greatly in quality, neither of the samples contained any ingredients injurious to health, or of a noxious character. On the whole the samples were much better in quality than last year. The Chairman said the report was highly satisfactory; one was curious to see if the cider was equally good, Somerset being a cider country.

Mr. J. Carter Bell, county analyst, reported to the Court of Quarter Session for Cheshire, that he had during the quarter ended September 30 analysed 89 samples, consisting of 56 beers, 5 gins. 1 whisky, 5 violet powders, 1 fuller's earth, 2 breads, 12 milks, 1 tea, 2 coffees, 1 hore-hound, and 2 lards Of these 4 were adulterated—2 milks, 1 gin, and 1 whisky. Of the 56 beers only 1 contained more than fifty grains of salt to the gallon; many of them contained only three or four grains.

At the Cheshire Quarter Sessions recently, the salary of the county analyst (Mr. J. Carter Bell) was increased from £100 to £200 per annum, on condition of his undertaking analyses of water for a fee of 6s., and also a more extensive and complete analysis of beer.

Mr. T. Fairley, analyst for the Borough of Leeds, reports that during the Michaelmas Quarter he examined eighteen samples, twelve being milks (one of which contained 12 per cent. of water), and two peppers, one flour, one bread, and two butters, all of which were genuine, though the latter were of poor quality.

Mr. Fairley also reports that, as analyst for the North Riding of Yorkshire, he examined, during last quarter, thirty-one samples, including one whisky, which contained 37 per cent. of water. A sample of sweet spirits of nitre contained an excessive proportion of water to the amount of 31 per cent., and no more than a trace of nitrous ether. Two peppers contained sand, one mustard 15 per cent. of wheat flour, and one oatmeal 20 per cent. of barley meal. The other samples, ten milks, one bread, one flour, three oatmeals, one sugar, six peppers, &c., were all genuine.

Mr. J. Baynes, public analyst for Kingston-upon-Hull, reports that in consequence of the prevalence of typhoid fever, he examined microscopically thirteen samples of milk and five of water during the past quarter, and they were all pure. He states that the Act has been a dead letter during the quarter, owing to the quibble which has been raised as to the term "prejudice of the purchaser."

Mr. Baynes also reports that, as analyst for the East Riding of Yorkshire, he examined 43 samples, including 18 milks, 10 of which contained added water, ranging from 5 to 22 per cent., 10 breads, of which only one was adulterated, but that seems to have been the very essence of adulteration, containing, as it did, the very large quantity of 22 grains of alum per 4-lb. loaf, 1 sample of butter, 1 of baking powder, 2 of coffee, 6 of lard, were all genuine. As were also 2 samples of oatmeal and 2 of pepper. One water was contaminated.

It is reported from Paris that 273 sacks of flour, supplied to the Chatellerault garrison, have been thrown into the Vienne, having been found so adulterated as to be unfit for food. The soldiers had long found fault with the bread, and the contractors will probably be prosecuted.

Two German State Analysts, Drs. Hebenstreit, of Chemnitz, and Skalweit, of Hanover, have published, in tabular form, the results of most minute analyses made by them of over forty samples of German Beers. In none were found anything besides malt, hops, yeast, and water.

LAW REPORTS.

EXTRAORDINARY CASE.—David Davis, milk dealer, 23, Red Cross Street, Borough, appeared before Mr. Benson, at Southwark Police Court, on an adjourned summons, obtained by Mr. Errington, the sanitary inspector of St. Saviour's District Board of Works, charging him with selling milk on the 20th ultimo containing 25 per cent. of added water. Mr. Simpson, clerk to the district board, prosecuted, and stated that on the 3rd instant the prisoner appeared before Mr. Partridge on the present charge, which he denied, and asked his worship to be allowed to send his sample of the milk to the Government analyst at Somerset House. That had been done, and now he (Mr. Simpson) and his witnessess attended to know the result. Mr. Benson told him he had received two certificates from the Government analyst. One marked 71 contained 25 per cent. of added water, and No. 72 was pure milk. It seemed to him very strange that such should be the case if the samples were taken at one and the same time. Mr. Errington was here sworn, and said that on the 20th of September he purchased the milk at defendant's shop, and told Mrs. Davis that he was going to have it analysed. In her presence he divided it in three portions, and sealed the bottles up with the official seal. One he left with Mrs. Davis, one he took to Dr. Bernays, and the third he kept, and marked 71. When the case was called on before Mr. Partridge on the 3rd instant, defendant produced what appeared to be the bottle of milk he left him, and said he was satisfied that it was genuine, and requested his worship to remit it to the Government analyst at Somerset House. Stewart Ramsay, 147 M, one of the officers of the court, said that by direction of Mr. Partridge he took the two sample bottles of milk to the Government analyst, at Somerset House. The one he received from the defendant he marked 72. The latter seemed to him to be rather loose at the cork, and it smelt rancid. The seal was on the cork, but did not touch the bottle. Mr. Errington was recalled, and in answer to Mr. Simpson, he said he had on several occasions taken milk from defendant's place for analysing, and had left several sealed bottles with him. The bottle of milk defendant sent to the Government analyst might have been one of them, as the sample was found to be good. Dr. Bernays, Professor of Chemistry at St. Thomas's Hospital, said he received a sealed bottle of milk from Mr. Errington on the 20th ultimo, and analysed it immediately. He found it to contain 25 per cent. of added water. He had compared the Government analyst's certificate, No. 71, with his own, and found them to correspond. He had also examined the Government analyst's certificate No. 72, and was positive that it could not be the same milk. It was impossible, and he had no hesitation in saying that it was not the sample left by Mr. Errington on the 20th ultimo. Mr. Benson here asked defendant what he had to say after such evidence. He replied that he was positive that the bottle of milk he handed into the court on the 3rd instant was the same his wife received from Errington on the 20th ultimo. All former samples were destroyed as soon as he knew no proceedings were taken against him. He called his wife to support his statement, when Mr. Benson said that after hearing the evidence of Mr. Errington and Dr. Bernays, he was satisfied that Defendant had committed a gross fraud on the Court, as well as the Government analyst, by handing in a sample of milk which had been left with him on a previous occasion. He therefore fined him £10, and £1 13s. costs. He could appeal if he thought proper.

At the Leek Police Session, before Joshua Brough, John Brough, J. Robinson, and Hugh Sleigh, Esqs., Mr. William Tunnicliffe, grocer, of Lognor, was charged by Major Knight, inspector under the Act, with having sold two ounces of mustard, which article was not of the nature and quality demanded. Mr. Broun, of Stockport, appeared for the defendant. William Gifford, the inspector's assistant, stated that on August 3rd he visited the defendant's shop and was supplied with two ounces of mustard, for which he paid 2½d. He then informed the defendant that he had purchased it with the intention of having it analysed by the public analyst. Major Knight put in a certificate from Mr. E. W. T. Jones, the county analyst, to the effect that the mustard contained only 72 per cent. of real mustard, and that the remaining 28 per cent. was chiefly wheat flour and a little turmeric. Mr. Broun said that the mustard supplied to the informant was manufactured by Messrs. Colman, of Norwich, and they had instructed him to appear on behalf of the defendant. This was not a case which was contemplated by the Act. Mustard was asked for. There were different kinds of mustard. There was the pure and simple flour of the mustard seed, and there was a mustard which was a condiment—mustard mixed with flour and turmeric. He took exception to the form of Mr. Jones's certificate. There was a form prescribed by the Act of Parliament in which these certificates should be made out, and this form had not been adopted. The magistrates, after a short consultation, decided to dismiss the case on the technical question raised by Mr. Broun of the form of the certificate.

At Cardiff Police Court, before the Mayor, Alderman Taylor, and Alderman Alexander, Mr. J. Rees, grocer, Grange Town, Cardiff, was summoned for refusing to supply police constable James with pepper for the purpose of analysis. The constable, who is employed on detective duty, said that on Saturday he went to the shop of the defendant and asked to be supplied with two ounces of pepper. The defendant replied that he had no pure pepper in stock, only a mixture. The constable then asked for two ounces of whatever kind the defendant had, and placed money upon the counter for payment of the article. The

defendant upon this said, "You have been bested once Mr. James, and I shall refuse to supply you with the pepper." The Bench characterised the offence of the defendant as serious, and said he would be fined 40s. and costs. He was liable to a fine of £10.

At the Gainsborough Police Court, on Tuesday, Catherine Metcalfe, of Corringham, was charged with having sold coffee adulterated with chicory and sugar. Superintendent Veitch bought a quarter of a pound of coffee at defendant's shop, and an analysis showed 17 per cent. of sugar, besides chicory. Defendant said the coffee tin contained the words "chicory and coffee," and she said it was so at the time. Two or three ounces sometimes represented her weekly sale, and she sold it as she bought it. Fined 10s. and costs.

At the Malton Sessions, on Saturday last, Mr. Lindall Anderson, grocer, &c., of Old Malton, was charged by Superintendent Park, inspector under the Food and Drugs Act, with selling sweet spirits of nitre, which, according to the analysis of Mr. Fairley, of Leeds, contained 46 per cent. of water, but no appreciable quantity of nitrous ether, the article on which its medicinal value entirely depended. The defence was that the nitre was sold in the same state as when procured from a wholesale druggist's firm, and also that defendant told the inspector that it was diluted. Superintendent Park denied that this was said until after he warned defendant that he was about to have the "sweet nitre" analysed. Defendant was fined the mitigated penalty of 10s. and 8s. costs, which he paid, remarking that he should expect the wholesale firm to refund him the amount.

At Bow street, William Pitt Hitchman 5, Museum Street, Bloomsbury, dairyman, was summoned for selling milk adulterated with water. The milk had been bought by Inspector Hoyle for the purpose of analysis, and this fact constituted the defendant's case. He did not deny that the milk was adulterated, but argued that under the Act it was necessary that the sale of the adulterated article should have been "to the prejudice" of the purchaser. A Scotch case in which it was said the Judges of Appeal had decided that this was the correct reading of the Act, was referred to in support of this argument. Sir James Ingham admitted that everything turned upon the exact meaning of these words in the Act, "to the prejudice of the purchaser," and said he remembered reading the Scotch case referred to. There was also a recent case, in which the Lord Chief Justice of England had, as he remembered, made some observations, rather bearing out the decision of the Scotch Judges. He should refer to both these cases during the remand. Mr. Poland appeared for the prosecution, and produced the English case referred to by Sir James Ingham. In that case, "Sandy v. Small," it was decided that when the purchaser knew the thing he was buying was adulterated, he was not "prejudiced" so as to bring the sale of the adulterated article within the meaning of the Act. The learned counsel argued that in the present case, although the inspector suspected the milk to be adulterated, he had no actual knowledge of that fact. Sir James Ingham said he should again adjourn the case. The matter was one of great importance, for it seemed to him that if the Scotch ruling was upheld the whole Act of Parliament would be made nonsense; if so they would require a new Act.—*Times.*

Adulterated Beer.—Richard Holmes, landlord of the Warwick Arms, Snow Hill, Birmingham, was summoned for selling beer adulterated with salt. Mr. Neville (instructed by Mr. Ansell) defended. Mr. F. Brooker, sanitary inspector, said that on the 24th of August he bought some beer at the defendant's house, stating at the time that he was going to have it analysed. He divided it into three parts, one of which he left at the house, and another he handed to the borough analyst. Dr. Hill, the borough analyst, said he had analysed the beer and found it to contain an excessive quantity of salt—94 grains to the gallon. Such an amount of salt was unnecessary and was injurious, inasmuch as it provoked thirst and incited to drink. Mr. Neville contended that the amount of salt was not excessive, stating that the excise authorities allowed 50 grains. He also urged that as the beer had not been bought by Mr. Booker for consumption the defendant could not in the words of the Act, be guilty of selling adulterated beer to the prejudice of the purchaser. He cited a case in which it had been decided that unless the beer was bought for consumption the prosecution must fail. Mr. Lowe said the question they had to decide was whether the quantity of salt was excessive. Ninety-four grains did appear to them to be a quantity of salt, which in the direction suggested by the analyst, would be injurious to health, as provoking undue thirst. The objection raised by Mr. Neville they should pass over. They had to deal with the case in a common sense way, and should fine the defendant 20s. and costs. Mr. Neville asked for a case for the superior courts. Mr. Lowe: We are bound to do that if you desire it. Mr. Fitter: There are two or three cases pending now.

Analysis of Wine.—M. Boussingault, director of the laboratory of the Agricultural Institute at Vincennes, is charged by the Minister of Agriculture to submit to analysis the various types of wines exhibited at the Exhibition. This investigation will include about ten thousand specimens of wines produced from all the wine-growing countries of the two hemispheres. M. Boussingault will be assisted by his son in this laborious and interesting work.—*Brewer's Guardian.*

NOTES OF THE MONTH.

We quote the following from the *Lancet;*—

The Newport (Isle of Wight) Town Council having received a letter from the Local Government Board inquiring upon what grounds they had arrived at the conclusion that there was no necessity for the appointment of a Public Analyst, decided that a reply be given to the effect that their conclusion was based on the fact that, as to prosecutions under the Adulteration of Food and Drugs Act, the law had been rendered inoperative by the judges, who had decided that adulteration was not to the prejudice of the purchaser, who purchased for the mere purpose of prosecuting the seller.

We cannot help thinking that when the Local Government Board finds such an impression as this getting abroad among Town Councils—and it is by no means an unusual impression, even in places where an analyst has been appointed—it is time the President thought of preparing a Bill for next session to remedy this and other existing defects in the present Act.

In another column will be found the report of a case heard before Mr. Benson, at the Southwark Police Court, which strongly illustrates the perils to which the reputation of a Public Analyst is every day exposed by the fraudulent tampering with duplicate samples. Happily in this instance the fraudulent act recoiled upon the head of the offender, and the strict lesson read by the infliction of a fine of £10 may deter other tradesmen from trying the same game. Analysts must be careful to see that whenever a tradesman's sample is sent to Somerset House the inspector's duplicate shall also invariably accompany it. The case is also satisfactory inasmuch as it is one of the first in which the analyst's certificate has actually agreed with that of the Government chemists. Will Dr. Bernays kindly for the benefit of his *confreres* give us his figures, and those found by the Court of Appeal, so that we may publish both, and get to the bottom of the allowance for decomposition in milk made by the latter?

No class of men could possibly have a greater interest in having questions of disputed nomenclature authoritatively settled than Public Analysts, and with no section of traders does this seem more difficult than with pharmacists. In that trade it is distinctly the interest of wholesome houses to perpetuate misnomers under the shadow of which they can vend inferior articles, and so appear to their customers as "cheap" houses. We have had at various times most acrimonious attacks made upon analysts who have, in the discharge of their duty, been obliged to certify that "sweet spirits of nitre" contained no nitrous ether, because we are told that sweet spirits of nitre does not mean *spiritus ætheris nitrosi* B.P., as commonly supposed by medical men and the public. Another striking feature of a similar nature was "milk of sulphur" containing two-thirds of its weight of calcium sulphate and held by the trade, and even by some of those who from their position ought to teach the trade, to be quite a different article to the pure *sulphur precipitatum* B.P., for which it is undoubtedly and unblushingly sold. Then again we have "white precipitate," of course *hydrargyrum ammoniatum* B.P. says the medical man who orders his patient to buy some and use it, but there he is wrong

again, it is not that article but *diammonium mercuric chloride*, containing about one-half of the proper amount of its *expensive ingredient*, namely mercury. Descending from drugs to cosmetics sold by the same trade we do not even then escape this mass of mystifications, as we suddenly learn that "violet powder," supposed by all to be scented starch, is not so, but is powdered *steatite*, *selenite*, or any other cheap mineral the vendor chooses to put up in a packet, add a little perfume, and label it "violet powder."

In the face of all this, it is encouraging to find our favourite enemy, the *Chemist and Druggist* speaking out boldly for once, forgetting the delinquencies of analysts to urge on the mineral water trade the definite abandonment of the name *soda water*. It is well known that for years no manufacturer has produced true soda water, but has simply bottled up water charged with carbonic acid, and sold it under that name. It appears that ten years ago before its vision was blinded by the "analyst" bogie, this really representative trade journal declared against the misnomer, and it now repeats its remarks. It gives an excellent suggestion that advertising makers of ærated water might even make popular capital out of the truth by selling "Blank's pure super-carbonated water, guaranteed to contain no alkalies, but to be prepared from pure water and carbonic acid." The truth is sure to prevail, and honesty is the best policy, and then *if it pays as well*, what a splendid thing it ought to be. But joking apart, Public Analysts should welcome this suggestion, which if adopted, would free them from at least one source of periodical abuse.

The loss of the Princess Alice has suggested to some persons that many of the unfortunate sufferers died poisoned by the foul water off Beckton, instead of by actual drowning. It is in the play of Faust, we think, that a certain eminent character, in answer to the hero's remark made, after killing Valentine, to the effect that it was not duel, but murder, says, "you make a delicate distinction where there is so little difference," and it is to be feared that, pure or impure, the unfortunate persons died from imbibing water. However, even such melancholy events do good in calling attention to the state of the river, and the analyses ordered by the Woolwich Local Board will be perused with much interest by the public.

In reply to a query from a correspondent as to whether the use of alum in baking powder would render the manufacturer liable to any penalty under the Sale of Food and Drugs Act, the *Chemist and Druggist* says:—"It would be bold to say that analysts will not bring such a case forward, but with our present light we certainly see very little chance of a succesful prosecution in such an event." It is to be hoped that makers of such compounds will soon obtain a little more light, because if a man be not directly

punishable for putting into a substance to be used for the making of bread, a chemical which is held to be an adulteration when found in that article, all we can say is, that law and justice would in this case be widely divorced. Certainly a baker who happened to be fined through the use of such a powder would have his remedy against the manufacturer. The *Chemist and Druggist* had better order his cook to select an alumed powder for making all his household bread and pastry, and then after a year publish the result of its action on his alimentary organs. Not that for a moment we mean to suggest the following up of the dictum *fiat experimentum, &c.*, because that would be both rude and vulgar.

We noticed the other day that an analyst of good repute had signed a letter as Y.Z., F.I.C. Now whatever meaning the gentleman referred to may attach to these letters, it is only right to point out that they do not constitute a legal or even a recognised title, and that if certificates so signed should unfortunately be produced in court, it would be found that the lawyers did not care a F I G for such a handle to a name, and would soon make its value like the Institute—"limited."

Patentees are suffering just now from one of the periodical attacks to which the class are subject. This time it has taken the form of electric fever, and specifications are being filed for improvements in the electric light, at the rate of about one per day. We fear a very small percentage will survive the payment of the £50 tax.

It is, however, very satisfactory to know that official trials are to be made in London of this means of lighting, and that the Corporation, who generally take a bold course in such matters, have decided to try not only one, but several of the systems which have been proposed of late. Some of the open spaces in London streets will afford admirable opportunities for such experiments.

The members of the Society of Public Analysts should pay special attention to the next meeting. Some important decisions must then be come to, as to the representations to be made to Government on the alterations necessary in the Sale of Food and Drugs Act. It is far too common to leave the executive of a society to settle such matters and then undertake the work, but if public analysts are not sufficiently interested in the matter to point out defects which have been found in their own experience, they can scarcely expect people to pay much attention to complaints after the event.

Analyst's Appointment.—The appointment of an analyst for Dorsetshire, under the Food and Drugs Act, 1875, was, at the Quarter Sessions recently, the subject of some discussion; Lord Portman presiding on the occasion, and Lord Shaftesbury being also present. The committee previously appointed to consider the question reported that they had received an application from Mr. Comyns Leach, of Sturminster; and they suggested that the borough authorities would do well to concur in the appointment of that gentleman. The chairman said the Local Government Board had intimated their approval of Mr. Comyns Leach's appointment by the county, and it was agreed to communicate with the boroughs on the subject, so that at the next sessions the matter might be settled. The Synod of Salisbury diocese petitioned the Court to appoint an analyst in the interests of temperance, the adulteration of beer and spirits being "injurious to the health and well-being of the public." The memorialists also represented that such adulteration was carried on to no small extent. The memorial was laid on the table, and a laugh was caused by Lord Portman remarking that it so happened that water was specially exempted by the Act from analysis.

RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1878. No.	Name of Patentee.	Title of Patent.	Price
804	P. S. Brown	Obtaining Sulphate of Ammonia from Ammoniacal Liquors	6d.
815	J. Mactear	Utilizing Lye Products of Soda and Potash Manufactures	4d.
861	T. F. Scott	Apparatus for Producing Electric Light	2d.
878	W. R. Lake	Manufacture of Celluloid	1/0
886	F. Werth	Purifying Gum, Resinous Oils, &c.	4d.
891	J. Barrow	Manufacturing Ammoniacal Salts	4d.
904	S. H. Parkes	Microscopes	2d.
915	H. C. Spalding	Transmitting Power by Electric Currents	6d.
921	T. Muir	Treatment of Wheat in the Manufacture of Wheaten Semolina, Meal, and Flour	4d.
924	E. Hopcroft	Filtering Water and Purifying the Animal Charcoal	6d.
929	P. Dronier	Electric Lamp Lighting Apparatus	2d.
934	J. B. Mackey & J. Sellers	Soap	2d.
945	C. B. Cooper & C. W. Smith	Soap	2d.
955	G. W. Von Mawrocki	Manufacture of Sulphur from Soda Residues, &c.	4d.
1021	H. and C. H. Hills	Treatment of Cupreous Pyrites	4d.
1084	W. J. Blinkhorn	Manufacture of Sulphuric Acid	4d.
1101	J. Moad	Manufacture of Iron and Steel	4d.
1112	T. J. Smith	Processes for Removing Moisture from Substances	6d.
1117	W. L. Wise	Producing Dyes from Products of Madder and Tar	4d.
1129	A. Browne	Destroying Vegetable Matter or Burl contained in Dyed Animal Fabrics	4d.
1131	J. Holloway	Producing Sulphur from Pyrites	4d.
1136	W. L. Wise	Production of Sulphate of Ammonia from the Nitrogen of Marshy Moors	10d.
1148	W. E. Newton	Manufacturing Sulphocyanides and Ferrocyanides	6d.
1156	T. Greenwood & T. C. Redman	Refrigerating Chambers for Preserving Meat	8d.
1186	C. N. May	Treating Oily and Fatty Matters	6d.
1201	R. Messel	Production of Monohydrated Sulphuric Acid	2d.
1224	G. F. Redfern	Aqueous Solutions of Tannin or Tanning Ooze	4d.
1623	J. Pintsch & J. Schülke	Apparatus for Lighting and Extinguishing Lights by Electricity	6d.
1705	H. Simon	Process and Apparatus for Developing Bromine	6d.
2069	R. S. Ripley	Manufacture of Gas for Heating, &c.	6d.
2213	E. J Corbett	Removing and Destroying Gases from Sewers	4d.
2217	W. R. Lake	Manufacture of Tablets, Cakes, or Blocks of Camphor	2d.
3109	S. Pitt	Evaporating Saline Solutions	6d.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Miller; The Anti-Adulteration Review; Journal of Applied Science; The Boston Journal of Chemistry; The Dairyman; The American Dairyman; The Practitioner.

THE ANALYST.

DECEMBER, 1878.

When The Analyst was started in 1876, the first number was issued in April, and the volumes have consequently extended from April in one year to March in the next year. This has been productive of considerable inconvenience to some of our subscribers, and we have therefore decided to alter it by making this number the final one of the third volume. Our readers will have noticed that we have carried on the paging from the end of the last volume, so that those who do not want to make a book so small as nine months' numbers can have the second and third volumes bound together.

The January number will then commence the fourth volume, and we shall hope, by the addition of still more new matter, and perhaps of even a larger number of original papers, to more than keep up the position we have already attained.

The title page and index to the third volume will be issued with the January number, but must be separately ordered by those who are not subscribers.

Many of our subscribers have paid their subscriptions up to March next, and the publisher will, of course, send them the first three numbers of the new volume. A subscription of 3s. 9d. will then become due for the remaining nine months of the year.

SOCIETY OF PUBLIC ANALYSTS.

A General Meeting of this Society was held at Burlington House, Piccadilly, on the 20th November, the President, Dr. Dupré, F.R.S., in the Chair.

The Minutes of the Meeting held in Dublin, were read and confirmed.

Dr. J. Baker Edwards, Public Analyst for the District of Montreal, Canada; and Mr. R. G. Fraser, Public Analyst fer the District of Halifax, Canada, were proposed for election as members. The ballot will take place at the Meeting, in January. The President said it must be very satisfactory to Members to know that the fame of the Society had extended to that distant Colony.

Mr. Bernard Dyer, and Mr. J. Newlands were appointed Auditors to examine the Accounts for the current year.

Dr. Dupré read a paper, "On the Sale of Food and Drugs Act in its relation to the dilution of Spirits."

Mr. Heisch also read a paper on the same subject.

Mr. Wigner read a paper, "On the clauses of the Sale of Food and Drugs Act which relate to the purchase of samples."

A long discussion ensued after the reading of these papers, and ultimately a Committee was appointed to consider the Amendments necessary in the Act, and to report thereon, and if necessary, to appoint a deputation to wait on the President of the Local Government Board.

Dr. Dupré read a paper, "On the Detection and Estimation of Alum in Wheat-Flour."

Mr. Wigner read a paper, "On Cleopatra's Needle," and another paper, "On the Nitrogenous Constituents of Cocoa."

ON THE SALE OF FOOD AND DRUGS' ACT, IN ITS RELATION TO THE DILUTION OF SPIRITS,

By A. Dupré, Ph.D., F.R.S.

Read before the Society of Public Analysts, on 20th November, 1878.

Towards the end of the last Session of Parliament, an amendment to the "Sale of Food and Drugs' Act Amendment Bill," was moved by Mr. Saul Isaac, and apparently supported by Government, which, in effect, directed that in judging of the adulteration of spirits by water, regard should be had, not only to the extent of the admixture, but also to the price at which the spirits so reduced were sold. This amendment will, most likely, be re-introduced during the coming session, and as it will, if passed, most seriously affect the working of the present Act, a short discussion in our Society regarding it, will not, I think, be out of place. In order to start such discussion, the following observations are offered:—

At first sight the proposed clause seems extremely fair and reasonable; a little closer examination, will, however, I believe, show that it would be quiet unworkable with the machinery established under the present Act. I say nothing here of the alteration in principle involved, which will also merit most serious consideration.

The amendment directs, that not only the extent of dilution, but also the price at which the reduced spirit has been sold is to be taken into consideration. But who is to be the judge of the fairness, or otherwise, of the price charged? It cannot be the analyst, for his analysis is absolutely useless for fixing the price, nor the inspector, for he has no special training as a spirit taster, neither can it be the magistrate, for he has only to decide on the evidence brought before him. Who then is to do this? are we to have special officers appointed under the Sale of Food and Drugs' Act, whose sole duty it will be to taste spirits found diluted by the analyst, and to decide what the value of the spirit was before it had been diluted, and are we to have a second Somerset House Court of Appeal to decide on questions even more difficult to settle than the amount of solids in milk.

An Act of Parliament must be taken in its widest application, and with our recent experience it would indeed be lamentable if a fresh loophole for evading the provisions of the Act were given to adulterators. If a principle is sound it may be pushed to its extreme legitimate conclusion, and yet be found valid. What, however, becomes of this clause if thus treated?

The wholesale price of French brandy, duty paid, and of about proof strength varies, roughly speaking, between about 15s. and 35s. per gallon. The higher priced brandy could therefore be diluted with water to nearly two and a half times its bulk, or be reduced to a strength of about sixty per cent. under proof, and still the cost of the article so reduced would be as high as that of the cheaper brandy undiluted. Is this diluted brandy to be passed as unadulterated? In such a case, the analyst, as before stated, would be absolutely incapable of deciding upon the value of the brandy on the strength of his analysis. Who then is to decide? and would not such a case give rise to an enormous amount of conflicting evidence? The same difficulty, though perhaps to a minor degree would arise, whatever might be the price of the brandy. If now we turn to whisky, we shall find that here also the prices vary, irrespective of mere alcoholic strength, but not to the same degree as in the case of brandy, though even here

the price, duty paid, may easily vary between 13s. 6d. and 18s. per gallon, and most probably, the cheaper would be the stronger. In such a case, therefore, one gallon of the more expensive whisky might be reduced so as to yield 1·33 gallon, and yet the cost price per gallon would be the same as that of the cheaper whisky unreduced. The variation is, I believe still less in the case of gin. As long, however, as there is any variation at all in the price of spirits, not governed by their alcoholic strength, the amendment proposed will be unworkable by the officials appointed under the present Act. It will no doubt be said that I have brought forward an extreme case, but my answer is that every such case, unless specially excluded, must be judged of by the provisions of the Act.

The clause under consideration is, I suppose, chiefly intended to apply to the spirits sold at public houses, or by small retail dealers, and if this be so, the clause might, perhaps, be amended as follows—"provided that the price per proof gallon as calculated from the price paid for the reduced spirit, does not exceed—

In the case of brandy ... ...
" whisky ... ...
" gin ... .

so, and so many shillings per proof gallon." These prices would have to be fixed by the Act, but this I think would offer no serious difficulty. The working of the clause would then be restricted to the cheaper kinds of spirit, and it could be worked by the officers at present appointed.

ON THE SALE OF FOOD AND DRUGS ACT, IN ITS RELATION TO THE DILUTION OF SPIRITS.

By C. Heisch, F.C.S.

Read before the Society of Public Analysts, on 20th November, 1878.

I was somewhat surprised to find myself put down for a formal paper this evening. I had intended to confine myself to some remarks on whatever might fall from our President, and though I have a paper before me, what I say must necessarily be more in the shape of remarks than an original communication.

I cannot quite agree with our President that to take price into account is an unmixed evil, especially in an article like spirits, much of which is sold according to its strength. I am quite aware that flavour and other circumstances affect the price of some spirits, as well as strength, but as a rule these are what may be called almost fancy spirits—fine old brandies, and so on, the purchasers of which can well take care of themselves. The spirits we have to do with are mainly those sold in small quantities in public-houses, and many of these are priced according to strength. Many houses of which Gilbey is a notable instance, price even brandies on the same principle. I have just heard of a case where some brandy was sold as Martell's *case brandy*, which turned out to be many degrees more under proof than any to be found in Martell's cases, and the vendor was convicted of selling an article under a false name, solely on the question of strength; but when spirits are mentioned, there is no doubt that gin is the one spirit more especially meant, and the dictum of Mr. Justice Grove that it should not be sold at more than twenty under proof, I have no doubt is what provoked the introduction of the clause in question. Having had a good deal to do with gin distillers, I know that,

unless specially ordered, it usually leaves their premises at either seventeen or twenty-two under proof, but is also prepared at thirty-three under proof for special market. Publicans, however, rarely buy anything but seventeen under proof. The price of this varies with the price of grain; it has been as low as 10s. per gallon, and as high as 12s. 1½d., but may be taken as averaging 11s. The publican puts to this, each his own flavouring, and brings it down to various other strengths, which are commonly known as 6d., 5d., and 4d. gins, that being the price per quartern at which they are sold. The precise degree of dilution will vary a little, but in round terms we may say that 6d. gin is from twenty to twenty-two under proof, 5d. from thirty to thirty-three under proof, and 4d. from thirty-nine to forty-two under proof. Now, if we take the price at 11s. per gallon for seventeen under proof, it costs the publican 4·12d. per quartern. To make it twenty-two under proof he has to add, in round numbers, half a pint, two quarterns of water to the gallon, which makes the cost per quartern 3·88d.; to bring it to thirty-three under proof 7·5 quarterns of water are added, which makes the cost 3·34d. per quartern; and to bring it to thirty-nine under proof he adds 11·54 quarterns, which makes the cost 3·03d. per quartern. Now, taking the selling prices before-mentioned, and the risks of waste, and all other expenses into account, this shows no excessive profit. Moreover, he can charge no more per quartern if he pays 12s. per gallon. The cost to him, in each case, is shown below :—

Cost at 12s. per gallon.	Per quartern.	Cost at 11s. per gallon.	Per quartern.	Sold at
17 U.P.	4·50d.	17 U.P.	4·12d. ...	6d.
22 U.P.	4·25d.	22 U.P.	3.88d. ...	6d.
33 U.P.	3·64d.	33 U.P.	3·34d. ...	5d.
39 U.P.	3·31d.	39 U.P.	3·03d. ...	4d.

Books are published, showing the publican at a glance what his spirits have cost him after various dilutions, according to the price he pays for them, and it seems to me only reasonable that a man who takes 4d. gin should be content with the dilute article, while one who pays 6d. and gets 39 U.P. has good reason to complain, and that the carrying out of Mr. Justice Grove's decision would cause considerable injustice. Practically price is taken into account. Two cases were tried at Greenwich, one of which was dismissed because the gin was as strong as could be expected for 5d., in the other the publican was fined for selling gin of about the same strength for 6d. Though difficulties might arise in some cases, I think they might be faced, in order that substantial justice might be done in general. Even in articles where we profess to have a standard, magistrates will now take price into consideration. We must all remember the case of watered milk, in which the magistrate, when he found that only 3½d. a quart had been paid, at once dismissed the case, at the same time asking the inspector what he could expect for the price. I should therefore not so much object to see the consideration of price clause introduced.

ON THE CLAUSES OF THE SALE OF FOOD AND DRUGS' ACT, WHICH RELATE TO THE PURCHASE OF SAMPLES.

By G. W. Wigner, F.C.S.

Read before the Society of Public Analysts, on 20th November, 1878.

Those who have followed the published reports of prosecutions under the above Act, will no doubt have been struck with the fact, that the defence in nine out of ten cases is

entirely of a technical character, and in the tenth case the defence set up is generally an alleged blunder on the part of the analyst. I need hardly remind you that these technical objections have taken every form, and have dealt at one time or other with every one of what may be called the working sections of the Act. In a large number of cases the objections have been taken under the section which relates to the labelling of samples—in as many, or perhaps even more instances, some quibble has been raised as to the precise form of the analyst's certificate, and several cases have broken down because the analyst had not thought it desirable to injure his balances by weighing a quartern loaf, and had not therefore stated the weight of the sample in his certificate. But the most important of all these, I may say, frivolous objections, and the one with which I shall more particularly deal this evening, is that which relates to the first few words of the sixth section, commonly known as the "prejudice to purchaser" clause.

Attention has of late been drawn very prominently to this clause, owing to some judicial decisions and expressions of opinion, which of course, have had great weight with magistrates, who have consequently dismissed several cases where there was no doubt that the articles had been tampered with, but because these articles having been bought by inspectors for analysis, and not for use, the magistrates considered that the inspectors were not prejudiced by having adulterated articles sold to them as pure.

It is quite evident that if the Act is not to remain a dead letter, a definite decision of the Supreme Court overruling this objection must be obtained, or the present Act must be amended. It is true that steps are being taken to obtain the opinion of a higher Court on the matter, but it seems highly improbable that any decision can be given for some months, and meanwhile in many districts the Act is rendered totally inoperative, and in other districts the authorities hesitate at prosecuting even in the most flagrant cases, lest they should be saddled with the costs, through the collapse of the case on this technical point.

A good many suggestions have been made to overcome this quibble—which I think has been allowed to succeed under a wrong idea, as I will presently show. Some of these suggestions equal the objection itself in quibbling—such for instance as instructing the inspectors to eat or consume a portion of every sample they purchase—or giving a portion of every sample to the inspectors—or giving them the residues of samples found to be pure and not the remains of adulterated samples, by which of course the inspectors would be actual losers, or even making the inspectors purchase the samples out of their own money.

It would, however, be eminently undesirable, even if not impracticable that any such tricky mode of procedure should be adopted, and to my thinking it is astonishing that we should have to consider what to do to meet the adulterator's objection. We may at once admit that an inspector who, by the direction and with the money of the local authority, purchases a sample for analysis, is not personally prejudiced if that sample turns out impure; but is it necessary that he should be? The Act says "to the prejudice of the *purchaser*," but the inspector is *not* the real purchaser—he is simply the servant and buys it by the direction of the local authority, and pays for it with their money, and therefore it seems to me that the purchaser is, not the inspector who merely goes into the shop and buys the sample, but the authority which instructed him and paid him to do it. And as to the local authority being prejudiced by their inspector buying an adulterated article, I consider that they are on several grounds—first they pay for an article not of the

nature and quality demanded, and next they have to institute a prosecution to get the vendor of this impure article punished. The Act does not define in what manner the "prejudice" is to arise, whether by a person being half poisoned with an adulterated article, or by paying for a pure article and getting an impure one, or by the expenses of a prosecution. And there can, therefore, be no doubt that the prejudiced parties are in the first instance the local authority; and ultimately the public, with whose money the sample is purchased, and who in turn are the masters of the local authority.

However, as another view has been judicially taken, it seems clear the Act must be amended, and as a considerable amount of discussion is certain to take place both in and out of Parliament when the amending Bill is brought forward, it appears desirable to recall what occurred while the Sale of Food Act was passing through the Houses of Parliament.

It will, no doubt, be in the recollection of many analysts that the clause in question did not appear at all in the Act when the latter was first introduced to Parliament as a draft Bill. This Bill was, no doubt, tinctured very strongly indeed with a trade bias, and the word "knowingly," and the phrase "usages of the trade," occurred so frequently and persistently, that it would probably have been almost impossible to have secured a conviction under it. The clause in question—the 6th—as it stood originally in the Bill, ran thus—"No person shall knowingly sell any article of food or any drug which is not of the nature, substance and quality of the article demanded by the purchaser." If this had stood without any qualification, it seems very probable that it might have answered the purpose for which it was intended, but unfortunately the clause went on to say "except as herein excepted or provided," and these exceptions were so wide that it was difficult to see what adulterations would not be passed. This became quite evident to the members of the House when the Bill was first discussed, and when it was reprinted before being considered in detail in committee, the words "to the prejudice of the purchaser" were found to have been introduced.

The discussion which took place on the first reading of the Bill gave some clue to the reasons for the introduction of these words. One of the speakers on that occasion read a communication which he had received from a public analyst and member of this society, in which, after pointing out a number of the defects in the 1872 Act, the writer went on to say that, as the samples brought to him for analysis were all purchased by inspectors in uniform, he always got the best of everything, and that when he wanted *cream* for his own use he sent an inspector to purchase *milk*, and always got cream instead. Some of the members of the House, with a keen eye to their trade constituents, naturally thought that this was unjust, and I believe that this was the first and, perhaps, only reason for the introduction into the Bill of the words referred to.

No one, however, appears to have at all thought of the perverted meaning which might be, and indeed has now been, placed upon them, for on looking carefully through the whole of the discussion which took place while the Bill was before Parliament, I find that, although every clause was criticized unfavourably from one or other point of view, the only criticism which appears to have been bestowed upon this phrase, was the general one that the Bill would have been much simpler and more workable if it merely enacted that "No person shall sell an adulterated article," and then set out in a schedule what should be considered as adulteration.

Even in the House of Lords, when this very clause was again recast, and the

exceptions in it very materially altered, no one seems to have thought that any harm could arise from leaving in the words "to the prejudice of the purchaser." In fact, viewed in a common-sense way, they appeared to mean simply what was intended, namely, that if a purchaser got a *better* article than he asked for the vendor should not be held to have committed an offence. So much, therefore, for what took place in Parliament.

Immediately the Act was passed, the National Chamber of Trade, who, from their own standpoint, had taken a very active part throughout in framing it, issued instructions for the guidance of retail traders, and on going through these I find that although the retail trader has most of the loopholes of the Act carefully pointed out to him, although he is particularly instructed to show to the satisfaction of the Court that he could not, with reasonable diligence have ascertained that the article sold by him was mixed or coloured, and although he is told to insist fully on the clauses for the division of samples, for the calling of the analyst as a witness, and for the appeal to Somerset House and to the Quarter Sessions, nothing whatever is suggested about the "prejudice to purchaser" question.

Very shortly afterwards the Local Government Board issued an official notification in reference to the Act to the Clerks of the Peace throughout the country. This, which was a carefully drawn up circular, pointed out the differences between the 1872 and 1875 Acts, and summed up the matter, as regards the public, by saying:—

(1.) "The new Act protects the purchaser against the delivery of any article which differs in substance, nature, or quality from the one demanded."

(3.) "It prevents the sale of articles mixed with ingredients, not in accordance with the demand of the purchaser, without a label indicating that they are mixed."

(7.) And (as if by way of satire on the Act) "it renders the law more intelligible."

Clearly, therefore, the Local Government Board did not believe that any difficulty was introduced by the words in question.

About the middle of 1877 the objection that the inspector was not prejudiced began to be taken by clever solicitors in defending adulteration cases, but as far as I can ascertain the objection was not sustained for some months, except in one case in the Midland Counties. It was then raised on appeal in a Scotch Court, and the opinion of the judges there was decidedly that the objection could be upheld. The point was subsequently referred to incidentally in a case in the Queen's Bench, and the opinion of the Lord Chief Justice coincided with that of the Scotch Judges. The natural consequence, of course, has been that many magistrates, in different parts of the country, have followed these rulings, and have dismissed cases simply on the ground of this technical objection having been taken. The objection has frequently been raised before several of the metropolitan magistrates (several times in my own hearing), but I am not aware that any of them allowed it until this month. When, however, Sir James Ingham, as the head of the metropolitan police magistrates, allows the objection—although during the very same week three or four of the other metropolitan magistrates decided not to follow his ruling—it is clear that the point cannot be decided by any mere discussion, but that we must at once endeavour to get an amending Bill introduced as soon as Parliament meets, because, although as I have mentioned an appeal case is coming before the Superior Courts, yet many months will probably elapse before a decision is obtained, and even then, if the judges should uphold the decision, we should still have to strive for an amending Act.

I have just put these facts before the Society in order that they be in a position to pass some definite resolution to-night as to the steps to be taken in the matter. Personally I am of opinion that a committee should be appointed, and that a deputation should be sent to the President of the Local Government Board, to ask him to introduce an amending Bill at the opening of the ensuing session. The question will then be open for discussion, as to whether we should suggest the desirability of any other amendment beside this particular one, and those which have been alluded to in the other papers read to-night. No doubt there are several other points which it would be desirable to have altered, but it must be borne in mind that every fresh alteration very probably means fresh opposition to the passing of an amending Bill.

Meanwhile, as to the "prejudice" question, until something is done the vestries and county authorities have, at any rate, one remedy in their hands, and they may do well to follow the example of one of the London District Boards, and for the present instead of prosecuting the vendors of samples found to be adulterated, direct these vendors' names to be read out at the Board meetings in order that they may be published in the newspaper reports. This, at least, would have the advantage of giving a considerable degree of publicity to the facts shown by the analyses, and might even prove as strongly deterrent as a prosecution and a light fine at the police courts, the reports of which are too often kept out of the newspapers.

In the discussion which took place on the preceding papers,

Mr. Angell said he thought that, as public analysts, they should not trouble themselves much about the question of price, as the matter would be rendered much more difficult if they took into consideration the different ways in which publicans sell their gin, but if they could arive at some understanding as to what the fair standard for gin should be they would have no more difficulty. If they entered into the question of price as to this, they must do so with regard to all trades.

Dr. Bartlett said he had had a good deal of professional business in connection with distillers, and also been consulted upon the analysis of a large number of samples of different spirits obtained in different parts of England. His experience so far agreed with that of Mr. Heisch's as to there being three different prices of gin and three different and varying degrees of dilution. This applied not only to London but to almost all the other towns of England. He had no hesitation in saying that when once the question of price was introduced into the certificates of analysts, these certificates would virtually become mere trade valuations, upon which no conviction for adulteration could be obtained. An article is demanded—say brandy. The question then came, what is brandy? As to its being more valuable or less valuable, that is the business of a trade expert or broker, but the analyst can only deal with the proportion of proof spirit and with the possible presence of injurious matters. With brandy as with whisky, certain limits of alcoholicity must be recognised as being those under which the trade is usually carried on by respectable dealers. These limits will have to be determined upon a sufficiency of sound evidence, and will form standards by which analysts will be guided in giving evidence as to undue dilution, which in itself constitutes adulteration. These standards of proportion of proof spirit, below which brandy and whisky ought not to be sold, might be discussed with propriety by the Society of Public Analysts, and a concerted action might be taken upon such agreed standards in the same way as had been done with

regard to milk. As for gin, if it were proved that "first," "seconds," and "thirds" gin are really required by the wants of the lower orders, an assertion which Dr. Bartlett strongly combatted, he thought similar limits of alcoholic strength might be adopted, but nothing could induce him to think it would be safe either to the public or to the analyst to have the quality known in any way by the price, which, after all, is entirely arbitrary. His experience had been that inferior spirits, sometimes the worst and the most injurious, although containing a minimum of alcohol, were sold in certain localities at higher prices than such as could be purchased in other neighbourhoods which were both stronger and more wholesome. The element of price, as regards the dilution of spirits, was therefore a complete snare, and would, he was sure, prove not only a delusion but the downfall of all efforts to promote purity and wholesomeness in the retailing of such articles. The importation of the question of price also imports the question of valuation, which he (Dr. Bartlett) regarded as the thin end of the wedge by which the purity of all articles of food, or drink, or of drugs, would have to be estimated by the double sliding scale of the prices at which the samples are sold and the amount of money-value received by the purchaser. Unless public analysts add to their chemical qualifications the prerogative of sworn trade valuers, asserting their competence to estimate every article of food and drugs; and unless their valuations are to be held in Court as legally indisputable, no conviction for adulteration will be sustained as long as price has to be considered. The Food and Drugs' Act would, under these circumstances, become a dead letter, and the appointments of public analysts must cease to exist. In some districts, and in some Courts, local authority and hypercritical judgment of the meaning of the Act already combine to throw its working powers into abeyance. He was informed that it was proposed at Arundel to appoint a public analyst (for the honour of the position) without salary, but with the assurance that he would not be expected to expend either his time or his chemicals, as "it was not intended to send any samples for analysis." So also the action of the Scotch Judges, and of Sir James Ingham, regarding the prejudice to purchaser when the samples were bought specially for analysis, showed a disposition to quibble at the obvious meaning of the Act, which is now having the most disastrous effect in directly inspiring a pettyfogging line of defence, which no respectable shopkeeper would adopt if he relied on the *bona fides* of the source from which he obtained the goods. The purchasing inspector is, however, undoubtedly the servant of the ratepayers, and it is difficult to see how such a ruling can be sustained on appeal.

Dr. Muter said that after the exhaustive remarks of Dr. Bartlett he did not see that much remained to be said. If it were simply a matter of limiting the thing to gin he should not object to Mr. Heisch's view, because his experience agreed with Mr. Heisch's as to there being three prices of gin. But the great difficulty was the getting in the thin edge of the wedge; when once they had anything to do with price they must apply it to everything, and then you must employ a spirit broker, and by and by there might be a class of milk brokers. In reality he thought what was wanted was to keep the Act strictly for what it represented itself to be, and that there should be some central authority appointed by the Government, whose duty it should be to enquire into and from time to time fix standards for various articles of food and drink. Nearly all the break-downs that had taken place had been over disputed standards—very seldom over a rea difference of opinion as to the chemical nature of a thing, but as to what the chemical nature meant. In conclusion Dr. Muter said he thought the appointment of a Committee

would meet with every one's approbation, and suggested that it should include some members of the Society outside the Council.

Dr. Dupré, in replying to the remarks made on his paper, agreed that gin was very little governed by quality, and that it might be taken under the clause, but unfortunately the clause did not say it was to be restricted to gin, and it would be applicable to all spirits sold unless any were specially excluded, and then the clause would be useless. Gin would be the least affected. They had not to deal with honest people, but with those who would break the law if they could. Dr. Dupré also thought a Committee should be appointed to consider the question.

Mr. Heisch pointed out that Mr. Paget, three or four days after Sir James Ingham gave his decision, not only decided a case in a precisely opposite direction, but cited a case in which Justices Mellor and Lush gave a decision contrary to Sir James Ingham, and Mr. Paget also said that he did not see what right a magistrate had to repeal an Act of Parliament.

After some further discussion, a Committee was appointed as stated on page 373.

ON CLEOPATRA'S NEEDLE.

By G. W. Wigner, F.C.S.

Read before the Society of Public Analysts on the 20th November, 1878.

I need hardly remind the members present that the granite of which Cleopatra's Needle is composed, was obtained from quarries situate at Syene, on the Nile. The general appearance of the granite is probably pretty well known, so that I need not do more than draw attention to the specimens, which, by the courtesy of Mr. Dixon, I am enabled to exhibit to-night. There will, however, I think, be some interest taken in the results of some analyses which I have recently made of different parts of it.

The specific gravity of the stone is 2·682. It has a very uniform density throughout, fragments broken from the top and bottom differing in gravity only in the fourth place of decimals. The surface of some portions, especially of that face which has laid upwards in Egypt is very considerably weathered, and it was consequently desirable to ascertain the relative absorbent powers of the unchanged stone and of the weathered surface when exposed to water. For this determination two pieces were selected, one of which was taken from the centre of the base, which had to be dressed flat in order to make the obelisk stand erect on its pedestal, and the other piece, which had a considerable portion of weathered surface on one side.

The lump of sound granite weighed about 2,000 grains, and after two days submersion in distilled water it had absorbed ·6 of a grain of water, but no further increase in weight took place although it was left some days longer under water and was repeatedly weighed. On being exposed to the air of a warm room for 24 hours it lost all the moisture it had absorbed, and weighed ·10 of a grain less than it did at first. Calculating as closely as I can, from the area of the rough stone, the absorption would be at the rate of 7·8 grains of water per square foot of surface.

The lump having a portion of the surface weathered, weighed about 3,300 grs.; after being submerged in distilled water for two days the weight had increased 1·3 grs., after two days more it had increased another 2 grs., after which time the weight remained

ery nearly constant. A considerable portion of the surface of this piece of stone was of course a recent fracture, and calculating the absorption of this newly fractured part at the same rate as above would only account for an increase of weight of ·70 grain. We have, therefore, 1·6 grs. absorbed by the weathered surface; this surface measured square inches and the absorption was therefore at the rate of 46·1 grs. per square foot, nearly six times as much as on the sound part. This absorption does not of course include surface moisture, as the surface water was in each case carefully removed by blotting, and the stone exposed for an hour on a table to a temperature of 65 Fahr. before being weighed.

The 46 grs. of absorption per square foot gives us a comparatively fair estimate of the amount of water which can be retained in the weathered surface and which is ready for its expansion on freezing to split or disintegrate that surface still further.

Another portion of the stone was roughly powdered and by means of Sonstadt's solution separated as far as possible into Mica, Quartz and Feldspar. After dividing it in this way into 12 or 14 portions of different gravities, the proportions of each of the proximate constituents were estimated so that the following results are probably within about 1 or at most 1·5 per cent. of the truth.—They showed,—

Mica ...	9	per cent.
Quartz	22	„
Feldspar	69	„
	100	

Taking pure fragments of each of the three constituents the specific gravities were found to be as follows:—

Mica ...	2·986
Quartz ...	2·747
Feldspar	2·595

I should note that the proportion of Mica varied considerably in different parts of the stone.

The portion of granite taken from the centre of the base and not weathered was analysed, and gave the following results:—

Silica ...	68·18	per cent.
Sesqui Oxide of Iron ...	4·10	„
Alumina	16·20	„
Lime ...	1·75	„
Magnesia	·48	„
Soda ...	2·88	„
Potash ...	6·48	„
Manganese	traces	
	100·07	

The portion taken from the exterior surface which was probably weathered as much as any portion of the Needle, gave the following results:—

Silica ...	70·36	per cent.
Sesqui Oxide of Iron ...	4·13	„
Alumina	15·37	„
Lime ...	2·05	„
Magnesia	·45	„
Soda ...	2·40	„
Potash ...	5·34	„
Manganese	slight traces	
	100·10	

It will be seen that the weathering has scarcely affected the iron. The alumina has decreased from 16·20 to 15·37, and the lime has increased from 1·75 to 2·05, while the alkalies show a decrease in the case of soda from 2·88 per cent. to 2·40 per cent. and in the case of potash from 6·48 per cent to 5·34 per cent.

A few of the most perfect crystals of Feldspar were picked out and analysed separately, and gave the following results:—

Silica	63·88	per cent.
Oxide of Iron and Alumina	22·25	"
Lime	1·09	"
Magnesia	·45	"
Soda	1·84	"
Potash	10·66	"
	100·17	

Some of the Mica separated and analysed in the same way gave the following results:—

Silica	41·16	per cent.
Oxide of Iron	7·30	"
Alumina	41·18	"
Magnesia	6·77	"
Soda	·92	"
Potash	5·24	"
	102·57	

The quantity of Mica separated was so small that it was impossible to repeat this analysis.

In conclusion, I must point out what an act of vandalism it would be to cover such a stone as this with silicate solution, as has been proposed. Such a solution would not even fill up the pores of the weathered portion, and it could not sensibly increase the coherence of the porous surface. The only proper course is to fill the pores with a non-porous and neutral substance—such as paraffin wax for instance.

CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

To the Editor of "The Analyst."

Sir,—As you have asked for information with reference to the case 71, heard by Mr. Benson, at the Southwark Police Court, I hasten to give you all that can be required. The milk analysed was done in duplicate, and the results given as follows:—

Total solids	9·46	9·34
Water	90·54	90·66
Fat	2·88	2·80
Solids* not fat	6·58	6·54
	100·00	100·00
*Ash	0·60	
Salt	0·20	

Using Professor Wanklyn's method of calculation, I gave it as containing nearly 25 per cent. of added water.

The sample of milk which the inspector was supposed to have left with defendant was brought into Court, and defendant insisted upon his sample being analysed at Somerset House. He doubtless thought

that judgment would be given upon his sample, which he had exchanged with a neighbour, whose milk was unexceptionably good. The certificate from Somerset House of the inspector's sample, after three weeks' keeping, read as follows:—

Water	90·93
Fat	2·91
Soiids not fat	6·16
	100·00

The opinion subjoined:—"This milk has not less than 22 per cent. of added water."

Since this report, another equally interesting one has been decided in Lambeth Police Court, before the presiding magistrate, Mr. Chance. I gave a certificate in the case of No. 77 of 7½ per cent. of added water, based upon the following analysis done in duplicate:—

Total solids	11·22	11·24
Water	88·78	88·76
Fat	2·91	2·98
Solids* not fat	8·31	8·26
	100 00	100·00
*Ash	0·71	
Salt	0·12	

In this case the analysis was not disputed, but the poor milk was owing to the class of cow, and if it be claimed as a pure milk, should be sold, as Mr. Chance suggested, as a poor milk. Dr. Redwood, analyst to the Metropolitan Dairymen's Society, was brought forward to prove that it was possibly a genuine milk. With the consent of Dr. Redwood, and on my suggestion—it having been admitted that this was a portion of mixed milk from 18 cows—the remainder of the herd, 15 in number, was milked next morning, and an analysis made both by Dr. Redwood, Mr. Stewart, and myself. The result was as follows:—

	Bernays.	Stewart.	Redwood.	Redwood.
Total solids	11·83	11·84	11·68	11·64
Water	88·17	88·16	88·32	88·36
Fat	2·63	2·68	2·60	2·62
Solids* not fat	9·20	9·16	9·08	9·04
	100·00	100·00	100·00	100·00
*Ash	0·84			
Salt	0·16			

We both agreed that this was genuine milk, and Dr. Redwood candidly admitted that my former analysis indicated a milk possibly but not probably genuine. The magistrate inflicted a fine of £10 and £5 5s. costs.

I may further mention that this sample which on a Saturday gave 9·20 solids not fat, gave 9·04 on Monday.

Yours faithfully,

ALBERT J. BERNAYS.

St. Thomas's Hospital,
November 18th, 1878.

ANALYSTS' REPORTS.

Milk Adulteration in Marylebone.—Mr. Alfred W. Stokes, the public analyst for Paddington, reports that during the last quarter, 21 articles of food had been submitted to him for analysis: and on the whole, he was sorry to state that a rather large amount of adulteration is still going on in the parish Of the 21 articles, no less than 18 were adulterated, the largest proportion being samples of milk. These numbered 14, of which two only were not adulterated. The rest were diluted with water, varying from 10 to 20 per cent. This adulteration might not be due solely, nor perhaps mainly to the London vendor for no fewer than 10 of the adulterated samples referred to were brought from the country supplier, to be re-sold here. This report having been presented to the Sanitary and Public Health Committee, they have passed the following important resolutions, viz., directing the inspector under the act forthwith to take proceedings against certain of the sellers of the samples referred to, and recommending that inasmuch as it appears the wholesale dealers will not prosecute the adulterators of milk in the country, the vestry do take such steps as may be necessary, to prosecute such wholesale dealers.

Mr. J. W. Gatehouse, the Public Analyst for Bath, reports that during the quarter ending September 28th he analysed 42 articles under the "Sale of Food and Drugs' Act," of which 39 were genuine and 3 were not genuine. These 3 articles consisted of milks, which were deficient in fat to the extent of 54, 30 and 25 per cent. respectively. The charges for the analyses, according to the scale agreed upon, amounted to £15 12s. 6d. For private individuals he had analysed 8 articles of food, in which 3 were genuine and 5 adulterated or unfit for food. Ale, 1 sample, genuine, but decomposed by keeping so as to be unfit for consumption; milk, 1 sample, contained 10 per cent. of added water; milk, 2 samples, unfit for food from containing blood; rum, 1 sample, containing resins.

At the last meeting of the Newport (Monmouthshire) Town Council, Mr. Thomas, the borough analyst, reported that on June 14 he analysed fifty samples, and during the last quarter he had also analysed fourteen samples. About twenty convictions under the Sale of Food Act had been obtained during the half-year.—At the last meeting of the Bath Town Council, Mr. J. Gatehouse, public analyst, presented his report for the quarter. He said he had analysed forty-two articles bought by the inspector, of which thirty-nine were genuine. Among the genuine samples were two of butter, two of confectionery, and one each of arrowroot, oatmeal, pepper and coffee. For private individuals he had analysed eight articles of food, of which three were genuine, and five adulterated or unfit for food. One adulterated sample was rum, containing resins. The results of the analyses of the articles brought by private individuals compared very unfavourably with those brought by the inspector.

LAW REPORTS.

At Bow Street, a summons against William Pitt Hitchman, of 5, Museum Street, Bloomsbury, for selling milk alleged to be adulterated with water to Hoyle, inspector of nuisances, was again before the Court, Sir James Ingham said in this case the adulterated milk sold by the defendant was purchased by a sanitary inspector, not for consumption, but for the purpose of analysis. The question was whether in such circumstances the milk was sold "to the prejudice of the purchaser" within the meaning of the 6th section of the Food and Drugs Act, 1875. A case very similar to the present came before the Justiciary Appeal Court of Scotland. The Court held that prejudice to the purchaser had not been proved, the purchase having been made for the purpose of analysis only. The same construction of the statute appeared to have been adopted by the Lord Chief Justice of England in the case of "Sandys v. Small." According to a report contained in *The Analyst* (which is in conformity with the report in the newspapers at the time), his Lordship said, with reference to adulterated whisky bought by an inspector for analysis. "I do not see how this inspector is prejudiced, as he did not drink the whisky." Sir James Ingham thought it would be unbecoming in him to express an opinion contrary to such high authorities, and therefore he dismissed the summons.—*Times.*

Subsequently upon the application of the counsel for the prosecution, a case was granted for the Court of Queen's Bench.

Lambeth.—Adulteration of Milk.—Mr. Marsden, Vestry Clerk of Camberwell, applied to Mr. Chance, and said the magistrate would remember that he had a case of milk adulteration before him a short time back, when an objection was taken that the inspector, as the purchaser, was not prejudiced, and his worship adjourned the matter to look into the case of "Sandys v. Small." Since then Sir James Ingham had given a decision which rendered it highly necessary that the vestries should take immediate steps. He therefore, now wished to ask his worship what opinion he held upon the point, as it was intended to take out other summonses under the Act. It would be satisfactory to the Vestry, to the public, and those tradesmen who sold a bonâ-fide article, to know what his worship thought on the matter. Mr. Chance considered it was a very proper application. He was anxious to hear Sir J. Ingham on the subject, and had an interview with him. Mr. Mayo had taken the same objection in this Court, but he, (Mr. Chance) had overruled it, as he considered it made the Act all nonsense. He considered also, that if any person paid the price of a pure article, and was served with water, it was sufficient to show the purchaser was prejudiced. He (Mr. Chance) should continue to hold his opinion until over-ruled by a decision in a superior Court against it. With regard to Sir James Ingham he saw the difficulty taking place, in the country particularly, in consequence of the decision in the Scotch Courts. Sir James Ingham told him that he considered the best course was to have the question decided by a superior Court, and that was partly why he gave the decision against the vestry. It was the best way to set the matter at rest. Mr. Chance further remarked that he saw that a few days back Mr. De Rutzen had refused to accept the objection, and convicted the defendants. He (Mr. Chance) repeated that in all cases brought before him and proved he should continue to impose penalties, as he considered he was justified in doing. Sir James Ingham was of the same opinion, but considered it best to have a case taken for the superior Court. It would be nonsense to imagine it was ever intended that persons should be supplied with milk and water for months, and the party supplying such a thing to ride off without conviction. Mr. Marsden thanked his worship, and stated that he would mention the matter to the vestry. —*Telegraph.*

MARYLEBONE.—ADULTERATION.—John Gowers, of 1, Marylebone Road, Paddington, appeared, in answer to an adjourned summons by the Vestry of Paddington, charging him with selling as pure milk found on analysis to be adulterated by the addition of 18 per cent. of water.—Mr. Hortin prosecuted for the Vestry, Mr. C. L. Berkeley defending —At the first hearing evidence was given as to the purchase of the milk by Thomas Reeves Clifford, sanitory inspector, and its analysis by the public analyst, and Mr. De Rutzen adjourned the case to enable him to look into the law and the decisions on the subject, having regard to the recent decision of Sir James Ingham, and also to the fact that the solicitors on both sides asked that, whichever way the decision went, he would grant a case.—Mr. Berkeley contended that the case was on all fours with that heard by Sir James Ingham, where the chief magistrate dismissed the summons, on the ground that the sample was purchased by the sanitary inspector, not for consumption, but for analysis, and, therefore, he was not prejudiced.—Mr. De Rutzen, in delivering his decision, said: The facts of this case are admitted, and the only contention on the part of the defendant is that, as the milk was purchased for the purpose of analysis, and not for consumption, it could not be said to be sold "to the prejudice of the purchaser" within the meaning of the 6th section of the Act. I am aware that there was a case decided in the Scotch courts where it was so held, but that case is not binding upon us, and I may add that the case of Sandys v Small, which is relied upon by the defendant, has in my opinion no bearing whatever upon this case. I have had to decide a great many of these cases, and I have always convicted where the circumstances of the cases have been similar to this, and in doing so I have not acted entirely upon my own view of the statute. There appears to me to be direct authority for it in the case of Sandys v Markham, 41, "Justice of the Peace," page 53, which was heard in the Queen's Bench before Justices Mellor and Lush, where this very point was raised. It was a case of selling adulterated mustard. The inspector bought a sample for analysis. The magistrate dismissed the information, and in the case which they stated for the opinion of the Queen's Bench they gave as one of the grounds of their decision "That (notwithstanding the fact that the appellant, in procuring the sample for analysis and not for consumption, pursued the course pointed out by section 14 for giving effect to the Act) the sale in question under the circumstances was not to the prejudice of the purchaser." This point, which went to the root of the whole case, was argued before the judges, and was disposed of by Mr. Justice Lush, who said, "Surely if the purchaser did not get pure mustard, as he was entitled to, prejudice must be presumed. I consider this a very strong case, and until it is decided otherwise, I shall continue to act upon that view. In this particular case there will be a fine of £10 and costs.—Mr. Berkeley asked whether, if he applied for a case, after looking into the decision, his worship would grant it.—Mr. De Rutzen said he would.—Four other cases were then gone into, the defendants' names and addresses and the degrees of adulteration being as follows: Richard Crofts, 2, Kilburn Park Road, Maida Vale, (defended by Mr. Berkeley), 15 per cent. of added water; George Robinson, 3, Kilburn Park Road, Maida Vale, 15 per cent. of added water; Emanuel Lawrence, 97, Chippenham Road, Paddington, 12 per cent. of added water; John Orchard, 16, Campbell Street, Hall Park, Paddington, 10 per cent. of added water.—Mr. De Rutzen said in all these cases a cruel fraud was committed on poor people by water being sold to them when they asked for milk. It was the added water that made the fraud, and the only way to stop it was by inflicting heavy fines on those who sold the adulterated milk to innocent people. There was no rule by which they should not sell milk and water, and no reason why they should not say to a customer, "I have a nice mixture of milk and water at so much a quart." It was the suppressing this very material fact that was the fraud.—The defendant Crofts was fined £10 and 2s. costs, Robinson £10 and 2s. costs, Lawrence £5 and 2s. costs, and Orchard £1 and 2s. costs.

At Bow Street police court, on the 20th November, Mr. Jones, solicitor to the parish of St. Giles, applied to Mr. Vaughan for summonses under the Adulteration Act. He said that before taking these summonses out, however, he should like to know whether Mr. Vaughan, after the recent decision of the chief magistrate, Sir James Ingham, would be inclined to give any decision in the cases. Several other London magistrates, since that decision, had not held themselves bound by it, but had convicted, their opinion being that in these cases the question of prejudice did not arise. Mr. Vaughan said he thought all these cases should stand over until the opinion of the superior Courts upon Sir James Ingham's decision had been taken. A case had been granted. Mr. Jones said no doubt that was so, but it had been fixed not to come on till next term. The matter was very serious, for since Sir James Ingham's decision, adulteration had been, and no doubt would continue, vastly on the increase. Mr. Vaughan repeated that all these cases ought to stand over till after the decision of the judges had been given. The proper course to pursue was to take out the summonses and then adjourn them until the point had been decided. He thought that whoever these summonses came before ought to adjourn them for that reason. Mr. Jones then took out some summonses in the ordinary course.

A statement is reported to have been made by Mr. Bridge which is interesting. After convicting a grocer named Horden of Goldhawk Road, for selling coffee mixed with chicory. Mr. Bridge (according to the *Daily News*) referred to the recent decision in a milk case heard at Bow Street, and said that as a doubt had arisen whether the officer of a parish was prejudiced in consequence of the decision in the Court in

Scotland and the reported dictum of the Lord Chief Justice of England, Sir James Ingham inquired of the defendant if he could have a case stated in the event of a conviction; but he declined to do so. Mr. Poland, who appeared for the parish, said he would take a case if the summons was dismissed. For the purpose of having the question decided, he dismissed the summons, and granted a case for the opinion of the Court of Queen's Bench. Sir James gave that decision simply for the purpose of having the case stated, and not to form a precedent. He (Mr. Bridge) believed that all the magistrates were of opinion that the selling of an article not of the substance and quality demanded was to the prejudice of the purchaser, whether an officer of the parish or any other person; otherwise the Act would become a dead letter. He should go on hearing cases; but he suggested that the parishes should not enforce the convictions until the question had been determined.—Mr. Jones said he was very glad to hear those remarks. He had no doubt that his Board would act upon them.—Mr. Bridge said he had been requested by Sir James Ingham to make that statement.

FLETCHER'S FURNACES.—We have recently had an opportunity of carefully testing the injector furnaces made by Fletcher of Warrington, and we find them certainly the most convenient and efficient gas furnaces we have yet seen. The burner is extremely simple, a horizontal tube about one inch in diameter and eight inches long, into the side of which the gas is led, while a jet of air is blown into its open end. The combustion of the gas seems absolutely perfect. Starting with the furnace cold, and even slightly damp, and with a gas supply from an ordinary ⅝ tap, cast iron in rough lumps was melted in seventeen minutes, and in nineteen minutes the melted mass weighed 3lbs. The crucibles, which the furnace is capable of taking, would hold three times this quantity, and 2lbs more were added and melted in a few minutes. In another experiment three crucibles full of soda lime holding about 1lb each were successively ignited to full red heat in sixteen minutes.

Messrs. Townson & Mercer have recently issued a new catalogue of chemical and physical apparatus. The book is well illustrated and the contents arranged in alphabetical order. We feel sure that a catalogue of this description will find favor with all requiring scientific apparatus. There are several new and useful instruments given, and also a series of sets of apparatus for the analysis of water, milk, tea, coffee, &c.

Messrs. M. Jackson & Co. have also issued a new list in book form, comprising a large number of pieces of apparatus for scientific purposes, and we note specially the catalogue of electrical galvanic and magnetic apparatus; also the sets for the Science and Art Department, and some comprehensive and well arranged sets for popular lectures. The list of apparatus for experiments in heat is most carefully got together.

These books are indeed a great improvement upon the usual price lists of apparatus, and will be very serviceable to analysts.

Mr. R. Oxland has been appointed Public Analyst for the Borough of Plymouth.

Mr. W. Pearce has been appointed Public Analyst for the Borough of Maidenhead.

Dr. Muter one of the Vice-Presidents of the Society of Public Analysts has been appointed Public Analyst for the Borough of Tenterden.

Dr. Thompson has been appointed Public Analyst for the Borough of Leamington.

THE ADULTERATION OF FOOD AND DRUGS.

SOME questions having been raised before the magistrates in Petty Sessions in Cumberland as to the power of the magistrates to convict in adulteration cases in which the adulterated article had been purchased by the officer acting on behalf of the local authority, Mr. Dunne, Chief Constable of the county, wrote to the Local Government Board, and has received the following reply:—

"Local Government Board, Whitehall,
"23rd November, 1878.

"Sir,—I am directed by the Local Government Board to advert to your letter of the 22nd ultimo, in which you request to be furnished with advice as to the course which should be adopted by the officers appointed to carry out the provisions of the Act 38 and 39 Vic., cap. 63, in view of the decision of the Queen's Bench Division of the High Court of Justice in a case to which your attention has been drawn.

"The Board presume that you intend to refer to certain expressions attributed to the Lord Chief Justice by some of the newspapers, in the case of 'Sandys v. Small,' to the effect that an officer appointed by a local authority to obtain samples could not be considered prejudiced by the purchase of adulterated articles procured under the orders of the local authority. The Board must, however, point out that the authorized report of that case (see 'Law Reports' 3, Q. B. Div., 449) does not contain the words in question, and, as a matter of fact, the case itself was decided upon quite a different ground.

"It should be further stated that in 'Sandys v. Markham,' reported in the *Justice of the Peace* 41, page 53, which was a case in which adulterated mustard had been purchased by an inspector for analysis, Mr. Justice Lush, in relation to the precise point referred to in your letter, distinctly said that 'if the purchaser did not get pure mustard, as he was entitled to, prejudice must be presumed.'

"The Board may add that several of the police magistrates in the metropolis, adopting the opinion of Mr. Justice Lush, have not hesitated to convict in cases where the purchase has been made not for consumption but for analysis, and the Board themselves entertain no doubt that this is the correct view.

"I am, Sir, your obedient servant,
"WALTON J. SENDALL, Assistant Secretary.

"To Mr. J. Dunne, Chief Constable of Cumberland and Westmoreland, Carlisle."

An Analyst for Dorset.—The question of appointing an analyst for this county was discussed at a recent meeting of the Dorchester Town Council. It appears the county authorities have suggested the appointment of Mr. Comyns Leach, a medical gentleman, of Sturminster Newton, as analyst for the whole of Dorset, and they want the boroughs to fall in with the proposal, so that there may be a joint appointment. A communication from the county on the subject having been read, various opinions were expressed. The retiring Mayor (Dr. Aldridge) suggested that the office, which might prove very valuable, should be thrown open to public competition. Mr. Alfred Pope (the Mayor elect) expressed a strong opinion that the analyst for the county, should reside at a more comeatable place than Sturminster, and in this several other councillors agreed. It was thought Dorchester would be a more central place of residence. The question was allowed to stand over, and is to receive further consideration.

A motion has been carried, on the recommendation of one of the Bermondsey vestrymen, to the effect that when the certificate was received from the analyst, the names of tradesmen from whom samples for analysis were obtained should be read at the vestry meetings, and subsequently published, as it was only fair that the ratepayers should know the honest shopkeepers as well as the dishonest.

NOTES OF THE MONTH.

The "Prejudice of the Purchaser," question has given a splendid loophole to those local authorities where the vested interest of adulteration is strongly represented, for escape from the necessity of enforcing the Act. Letters from all parts have poured in upon us this month, showing the eagerness with which the point has been seized, and we must apologise to our correspondents for not inserting them, owing to the large amount of space demanded by the proceedings of the Society itself, which, of course, must take precedence.

One letter, however, from Mr. Edger is very instructive, showing that owing to the Magistrate's Clerk having adopted the point, proceedings have been rendered impossible on seven samples of bitartrate of potash which he has had submitted to him by his Inspector for Stockton, with the following results:—

No. 1 contained	Tartrate of Lime	8·4
	Sulphate of Baryta	1·24
	Silicious Matter	1·30
No. 2 „	Tartrate of Lime	4·80
	Bicarbonate of Soda	10·00
No. 3 „	Tartrate of Lime	6·30
No. 4 „	Tratrate of Lime	7·50
	Sulphate of Baryta	·60
	Scilicious Matter	·46
No. 5 „	Tartrate of Lime	8·10
No. 6 „	Tartrate of Lime	8·10
No. 7 „	Tartrate of Lime	7·30

As a statement to that effect must, of course, be made in the quarterly report, without any test of it by proceedings, we publish it now so as to prevent the *Chemist and Druggist* blaming the analyst when it does so appear. Whether the presence of a reasonably small quantity of tartrate of lime in commercial cream of tartar is or is not permissible, is a question which would have to be decided before a court of law, but bicarbonate of soda clearly ought not to be found, and the mixture of barium sulphate would not be defended even by our contemporary. It is unfortunate that this clog upon the wheels of justice should have occurred in Stockton, both in the interests of the public, and of respectable Pharmacists who properly satisfy themselves of the reasonable purity of the articles they deal in.

We have received from Mr. Adams a very interesting statement of the results of the working of the Act in Kent, which shows how successful the Act really is in crushing out adulteration when properly enforced:—

Quarter ending	Samples received.	Percentage of Adulterated samples.
March, 1875	109	23·85
June, 1875	558	9·85
September, 1875	507	4·53
December, 1875	105	2·85
March, 1876	none	—
June, 1876	none	—
September, 1876	none	—
December, 1876	8	—
March, 1877	none	—
June, 1877	2	—
September, 1877	none	—
December, 1877	none	—
March, 1878	137	13·14
June, 1878	69	8·70
September, 1878	65	13 84

So we see that given a fair and regular pressure of the Act we in one year reduce the percentage of impurity from 23·85 to 2·85. Then comes laxity and up goes the percentage to 13·14. The 137 visits of the inspectors produce their effect and down drops the percentage to 8·7, only, however, to rise to 13·84 when the pressure is again relaxed. If more of our members would take a similar amount of trouble many interesting statistics might be had to strengthen the hands of our recently-appointed Parliamentary Committee.

RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1878. No.	Name of Patentee.	Title of Patent.	Price.
1281	C. Leach and T. Neal	Calcining Sulphate of Iron for Manufacture of Pigments	6d.
1347	J. B. White and A. Glover	Manufacture of Portland Cement	6d.
1361	E. G. Wheeler	Compressing Ammoniacal and other Gases	2d.
1384	F. Wirth	Manufacture of Tartaric Acid	4d.
1406	D. Walker	Distilling Alcoholic Spirits	6d.
1417	S. Hallsworth and R. Bailes	Treating Sewage	2d.
1444	R. Siegler	Manufacture of Picric Acid	2d.
1504	J. A. Wanklyn and W. Cooper	Determining Organic Matters contained in Solution	4d.
1523	F. Wirth	Manufacture of Sulphuric Acid	2d.
1626	W. Morgan Brown	Siliceous Compound	4d.
1674	B. H. Remmers	Treating Waste Liquors from Dye Works	2d.
1703	W. R. Lake	Sugar	2d.
2486	H. B. Gross	Soap	2d.
3237	E. A. Parnell	Manufacture of Zinc Oxide	2d.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Miller; The Anti-Adulteration Review; Journal of Applied Science; The Boston Journal of Chemistry; The Dairyman; The American Dairyman; The Practitioner.

Funny Folks has the following, *àpropos* of the recent decision "that there can be no conviction for adulteration of whisky where the inspector does not drink any, and so is not prejudiced." It is headed "A Martyr to Duty." *Inspector* (*to Analyst*): 'Tosticated? Not 't all! M-my duty to be pre-prejudiced. *Am* pre-pre-prejiced. Thas all.